

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 December 2001 (27.12.2001)

PCT

(10) International Publication Number
WO 01/98499 A1

(51) International Patent Classification⁷: **C12N 15/31**,
15/63, G01N 33/68, C07K 14/31, A61K 39/085, C07K
16/12, C12N 5/12, A61K 39/40

of Molecular Biology and Biotechnology, University of
Sheffield, Firth Court Western Bank, Sheffield S10 2TN
(GB).

(21) International Application Number: **PCT/GB01/02685**

(74) Agent: **HARRISON GODDARD FOOTE**; Tower
House, Merriam Way, Leeds LS2 8PA (GB).

(22) International Filing Date: **20 June 2001 (20.06.2001)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
0014907.0 **20 June 2000 (20.06.2000)** **GB**

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GI,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK,
SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA,
ZW.

(71) Applicants (*for all designated States except US*): **UNI-
VERSITY OF SHEFFIELD** [GB/GB]; Western Bank,
Sheffield S10 2TN (GB). **BIOSYNEXUS INC.** [US/US];
Suite 100, 9610 Medical Centre Drive, Rockville, MD
20850 (US).

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF,
CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **FOSTER, Simon**
[GB/GB]; Department of Molecular Biology and Biotech-
nology, University of Sheffield, Firth Court Western Bank,
Sheffield S10 2TN (GB). **McDOWELL, Philip** [GB/GB];
Department of Molecular Biology and Biotechnology, Uni-
versity of Sheffield, Firth Court Western Bank, Sheffield
S10 2TN (GB). **BRUMMELL, Kirsty** [GB/GB]; Depart-
ment of Molecular Biology and Biotechnology, University
of Sheffield, Firth Court Western Bank, Sheffield S10
2TN (GB). **CLARKE, Simon** [GB/GB]; Department

Published:

- *with international search report*
- *before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments*

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: **ANTIGENIC POLYPEPTIDES**

(57) Abstract: The invention relates to a method for the identification of antigenic polypeptides expressed by pathogenic microbes; vaccines comprising said polypeptides; recombinant methods to manufacture said polypeptides; and therapeutic antibodies directed to said polypeptides.



WO 01/98499 A1

Antigenic Polypeptides

The invention relates to a method for the identification of antigenic polypeptides expressed by pathogenic microbes; vaccines comprising said polypeptides; 5 recombinant methods to manufacture said polypeptides; and therapeutic antibodies directed to said polypeptides.

Microbial organisms cause a number of fatal or debilitating diseases which affect many millions of people around the world. Currently methods to control microbial 10 organisms include the use of antimicrobial agents (antibiotics) and disinfectants. These have proved to be problematic since exposure to these agents places a significant selection pressure resulting in the creation of resistant microbes which can avoid the effects of the antimicrobial agent(s). For example, recently it has been discovered that microbial organisms have become resistant to triclosan, an agent 15 added to many disinfectants used in households and industrial environments.

An arguably greater problem is the evolution of antibiotic resistant strains of a number of significant pathogenic microbes.

20 For example, and not by way of limitation, it is estimated that there are up to 50 million people world-wide infected with drug resistant tuberculosis (TB) (Figures from the World Health Organisation, 1998). In the past the use of antibiotics to treat TB relied on the administration of single drugs (eg ethionamide) which promoted a relatively high frequency of resistance. For this reason, combinations of drugs are 25 now used to treat tuberculosis. However the fatality rate in cases caused by strains that are resistant to at least one drug used to treat tuberculosis still approaches 50% even when treatment is given. *Mycobacterium tuberculosis*, the causative agent of TB, is a slow growing bacteria and takes a long time to kill. Therefore, for a drug combination to be effective a person with TB must take the drug combination daily 30 for at least six months. Accordingly, patients frequently have to take two or more pills daily and this requires a regimented dosage over a relatively long period of

treatment. Many patients take the medications only intermittently and therefore do not finish the full course of therapy to completely eradicate the *M. tuberculosis* infection. Moreover, TB is strongly associated with HIV infection and therefore the establishment of TB is strongly correlated with immunosuppression.

5

Vaccination against TB has been available for many years. The bacillus calmette and guerin (BCG) vaccination has been widely used throughout the world for a long time because it is a safe and inexpensive means to vaccinate large numbers of people who potentially could contract TB. BCG is derived from live, attenuated strains of
10 *Mycobacterium bovis*. However the impact of vaccination on the infectious forms of TB is minimal and BCG has therefore contributed little to the overall control of the disease.

A further example of a pathogenic organism which has developed resistance to
15 antibiotics is *Staphylococcus aureus*. *S.aureus* is a bacterium whose normal habitat is the epithelial lining of the nose in about 20-40% of normal healthy people and is also commonly found on people's skin usually without causing harm. However, in certain circumstances, particularly when skin is damaged, this germ can cause infection. This is a particular problem in hospitals where patients may have surgical
20 procedures and/or be taking immunosuppressive drugs. These patients are much more vulnerable to infection with *S.aureus* because of the treatment they have received. Resistant strains of *S.aureus* have arisen in recent years. Methicillin resistant strains are prevalent and many of these resistant strains are also resistant to several other antibiotics. Currently there is no effective vaccination procedure for *S.*
25 *aureus*. In the US, *S.aureus* infections are the cause of 13% of the two million hospitalised infections each year. This represents 260,000 people with an infection of *S.aureus*, of which 60-80,000 die.

S. aureus is therefore a major human pathogen capable of causing a wide range of
30 life threatening diseases including septicaemia, endocarditis, arthritis and toxic shock. This ability is determined by the versatility of the organism and its arsenal of

components involved in virulence. Pathogenicity is multifactorial and no one component has shown to be responsible for a particular infection, see Projan, S.J. & Novick, R.P. (1997) in *The Staphylococci in Human Disease* (Crossley, K.B. & Archer, G.L., eds.) pp.55-81.

5

At the onset of infection, and as it progresses, the needs and environment of the organism changes and this is mirrored by a corresponding alteration in the virulence determinants which *S. aureus* produces. At the beginning of infection it is important for the pathogen to adhere to host tissues and so a large repertoire of cell surface associated attachment proteins are made. These include collagen-, fibrinogen- and fibronectin-binding proteins. The pathogen also has the ability to evade host defences by the production of factors that reduce phagocytosis or interfere with the ability of the cells to be recognised by circulating antibodies.

15 Often a focus of infection develops as an abscess and the number of organisms increases. *S. aureus* has the ability to monitor its own cell density by the production of a quorum sensing peptide. Accumulation of the peptide, associated with physiological changes brought about by the beginning of starvation of the cells, elicits a switch in virulence determinant production from adhesins to components involved in invasion and tissue penetration. These include a wide range of hemolysins, proteases and other degradative enzymes.

During the process of any infection the virulence determinants made by *S. aureus* are produced in response to environmental and physiological stimuli. These stimuli will be dependent on the niche within the body and will change as the infection progresses. Little is known of the conditions *in vivo* and it is likely that some components are produced solely in this environment. These are therefore potential vaccine components, which could not be discovered by previous techniques.

30

One of the most important developments in recent medical history is the development of vaccines which provide prophylactic protection from a wide variety of pathogenic organisms. Many vaccines are produced by inactivated or attenuated pathogens which are injected into an individual. The immunised individual responds
5 by producing both a humoral (antibody) and cellular (cytolytic T cells, CTL's) response. For example, hepatitis vaccines are made by heat inactivating the virus and treating it with a cross linking agent such as formaldehyde. An example of an attenuated pathogen useful as a vaccine is represented by polio vaccines which are produced by attenuating a live pathogen.

10

However the use of attenuated organisms in vaccines for certain diseases is problematic due to the lack of knowledge regarding the pathology of the condition and the nature of the attenuation. For certain viral agents this is a particular problem since viruses, in particular retroviruses, have an error prone replication cycle which
15 results viable mutations in the genes which comprise the virus. This can result in alterations to antigenic determinants which have previously been used as vaccines. An alternative to the use of inactivated or attenuated pathogens is the identification of pathogen epitopes to which the immune system is particularly sensitive. In this regard many pathogenic toxins produced by pathogenic organisms during an
20 infection are particularly useful in the development of vaccines which protect the individual from a particular pathogenic organism.

The development of so-called subunit vaccines (vaccines in which the immunogen is a fragment or subunit of a protein or complex expressed by a particular pathogenic
25 organism) has been the focus of considerable medical research. The need to identify candidate molecules useful in the development of subunit vaccines is apparent not least because conventional chemotherapeutic approaches to the control of pathogenic organisms has more recently been stymied by the development of antibiotic resistance. A number of methods have been developed to identify potential antigenic
30 polypeptides which can be used as a vaccine. One such method is disclosed herein.

It has been known for many years that tumour cells produce a number of tumour cell specific antigens, some of which are presented at the tumour cell surface. The immune system recognises these antigens as foreign thereby resulting in the production of antibodies to self antigens, so called autoantibodies or autologous antisera.

One such technique is Serological identification of antigens by recombinant Expression Cloning, abbreviated to SEREX.

Typically, the technique involves the extraction of RNA from tumour tissue followed by the selective enrichment of mRNA from the isolated total RNA. The mRNA is reverse transcribed into cDNA using viral reverse transcriptase. The cDNA thus synthesised is subcloned into an expression vector and transformed into an appropriate bacterial strain. The transformed bacteria are plated onto a suitable nutrient agar and under appropriate growth conditions the subcloned cDNA is expressed from the expression vector in the bacterial cell. The cells are lysed naturally by the use of phage based expression vectors, for example λ phage or phagemid based vectors, which through their lytic cycle cause cell lysis. The released polypeptides are transferred to a suitable membrane support (i.e. nitrocellulose, nylon) and exposed to autologous antisera from the patient from which the tumour tissue was originally isolated. The immunoscreening methodology allows the identification of genes that are over expressed or inappropriately expressed in a selected tumour tissue from a patient.

We have exploited this technique to identify antigenic polypeptides expressed by pathogenic organisms during an infection. Autologous antisera produced during the infection is used to screen an expression library created from genomic DNA to identify and clone antigens.

In its broadest aspect the invention relates to the identification of antigenic polypeptides expressed during an infection by a pathogenic microbe.

According to a first aspect of the invention there is provided a method to identify
5 antigenic polypeptides comprising:

- (i) providing a nucleic acid library encoding genes or partial gene sequences of a pathogenic organism;
- 10 (ii) transforming/transfecting said library into a host cell;
- (iii) providing conditions conducive to the expression of said transformed/transfected genes or partial gene sequences;
- 15 (iv) contacting the polypeptides expressed by the genes/partial gene sequences with autologous antisera derived from an animal infected with, or has been infected with, said pathogenic organism; and
- (v) purifying the nucleic acid encoding the polypeptide or partial polypeptide
20 binding to said autologous antisera.

In a preferred method of the invention said library comprises genomic DNA of a pathogenic organism.

25 Ideally said pathogenic organism is bacterial.

More preferably still said bacterial organism is selected from the following:

Staphylococcus aureus; *Staphylococcus epidermidis*; *Enterococcus faecalis*;
Mycobacterium tuberculosis; *Streptococcus group B*; *Streptococcus pneumoniae*;
30 *Helicobacter pylori*; *Neisseria gonorrhoea*; *Streptococcus group A*; *Borrelia*

burgdorferi; *Coccidiodes immitis*; *Histoplasma sapsulatum*; *Neisseria meningitidis* type B; *Shigella flexneri*; *Escherichia coli*; *Haemophilus influenzae*.

Preferably still said pathogenic organism is of the genus *Staphylococcus* spp. Ideally
5 organism is *Staphylococcus aureus* or *Staphylococcus epidermidis*.

In a further preferred embodiment of the invention said nucleic acid library is a lambda library, ideally a lambda expression library.

10 According to a second aspect of the invention there is provided a nucleic acid molecule comprising a DNA sequence selected from:

- (i) the DNA sequence as represented in SEQ ID NO's 1 – 13;
- 15 (ii) DNA sequences which hybridise to the sequence presented in the SEQ ID No's 1-13 identified in (i) above which encode a polypeptide expressed by a pathogenic organism and
- (iii) DNA sequences which are degenerate as a result of the genetic code to the
20 DNA sequences defined in (i) and (ii).

In a yet still further preferred embodiment of the invention said nucleic acid molecule is genomic DNA.

25

In a preferred embodiment of the invention there is provided an isolated nucleic acid molecule which anneals under stringent hybridisation conditions to the sequences presented in SEQ ID NO's 1- 13.

30 Stringent hybridisation/washing conditions are well known in the art. For example, nucleic acid hybrids that are stable after washing in 0.1xSSC, 0.1% SDS at 60°C. It

is well known in the art that optimal hybridisation conditions can be calculated if the sequences of the nucleic acid is known. For example, hybridisation conditions can be determined by the GC content of the nucleic acid subject to hybridisation. Please see Sambrook *et al* (1989) Molecular Cloning; A Laboratory Approach. A common
5 formula for calculating the stringency conditions required to achieve hybridisation between nucleic acid molecules of a specified homology is:

$$T_m = 81.5^{\circ} \text{C} + 16.6 \text{ Log } [\text{Na}^+] + 0.41 [\% \text{ G} + \text{C}] - 0.63 (\% \text{ formamide}).$$

10 According to a third aspect of the invention there is provided at least one polypeptide identified by the method according to the invention.

In a preferred embodiment of the invention, said polypeptide is associated with infective pathogenicity of an organism according to any previous aspect or
15 embodiment of the invention.

More preferably still said polypeptide is at least one, or part of SEQ ID NO's: 14- 19.

According to a fourth aspect of the invention there is provided a nucleic acid
20 molecule characterised in that said nucleic acid molecule is part of a vector adapted to facilitate recombinant expression of the polypeptide encoded by said nucleic acid molecule.

In a preferred embodiment of the invention said vector is an expression vector
25 adapted for prokaryotic gene expression. Alternatively said expression vector is adapted for eukaryotic gene expression.

Typically said adaptation includes, by example and not by way of limitation, the provision of transcription control sequences (promoter sequences) which mediate cell
30 specific expression. These promoter sequences may be cell specific, inducible or constitutive.

- Promoter is an art recognised term and, for the sake of clarity, includes the following features which are provided by example only, and not by way of limitation. Enhancer elements are *cis* acting nucleic acid sequences often found 5' to the transcription initiation site of a gene (enhancers can also be found 3' to a gene sequence or even
- 5 located in intronic sequences and is therefore position independent). Enhancers function to increase the rate of transcription of the gene to which the enhancer is linked. Enhancer activity is responsive to *trans* acting transcription factors (polypeptides) which have been shown to bind specifically to enhancer elements. The binding/activity of transcription factors (please see Eukaryotic Transcription Factors,
- 10 by David S Latchman, Academic Press Ltd, San Diego) is responsive to a number of environmental cues which include, by example and not by way of limitation, intermediary metabolites (eg glucose, lipids), environmental effectors (eg light, heat,).
- 15 Promoter elements also include so called TATA box and RNA polymerase initiation selection (RIS) sequences which function to select a site of transcription initiation. These sequences also bind polypeptides which function, *inter alia*, to facilitate transcription initiation selection by RNA polymerase.
- 20 Adaptations also include the provision of selectable markers and autonomous replication sequences which both facilitate the maintenance of said vector in either the eukaryotic cell or prokaryotic host. Vectors which are maintained autonomously are referred to as episomal vectors.
- 25 Adaptations which facilitate the expression of vector encoded genes include the provision of transcription termination/polyadenylation sequences. This also includes the provision of internal ribosome entry sites (IRES) which function to maximise expression of vector encoded genes arranged in bicistronic or multi-cistronic expression cassettes.

30

These adaptations are well known in the art. There is a significant amount of published literature with respect to expression vector construction and recombinant DNA techniques in general. Please see, Sambrook et al (1989) Molecular Cloning: A Laboratory Manual, Cold Spring Harbour Laboratory, Cold Spring Harbour, NY and
5 references therein; Marston, F (1987) DNA Cloning Techniques: A Practical Approach Vol III IRL Press, Oxford UK; DNA Cloning: F M Ausubel et al, Current Protocols in Molecular Biology, John Wiley & Sons, Inc.(1994).

10 According to yet a further aspect of the invention there is provided a method for the production of the polypeptides according to any previous aspect or embodiment of the invention comprising:

- 15 (i) providing a cell transformed/transfected with a vector according to the invention;
- (ii) growing said cell in conditions conducive to the manufacture of said polypeptides; and
- 20 (iii) purifying said polypeptide from said cell, or its growth environment.

In a preferred method of the invention said vector encodes, and thus said recombinant polypeptide is provided with, a secretion signal to facilitate purification of said polypeptide.

25

According to a fifth aspect of the invention there is provided a cell or cell-line transformed or transfected with the vector according to the invention.

In a preferred embodiment of the invention said cell is a prokaryotic cell.
30 Alternatively said cell is a eukaryotic cell selected from: fungal, insect, amphibian; mammalian; plant.

According to a yet further aspect of the invention there is provided a vaccine comprising at least one polypeptide according to the invention.

- 5 Ideally said vaccine further comprises a carrier and/or adjuvant.

The terms adjuvant and carrier are construed in the following manner. Some polypeptide or peptide antigens contain B-cell epitopes but no T cell epitopes. Immune responses can be greatly enhanced by the inclusion of a T cell epitope in the
10 polypeptide/peptide or by the conjugation of the polypeptide/peptide to an immunogenic carrier protein such as key hole limpet haemocyanin or tetanus toxoid which contain multiple T cell epitopes. The conjugate is taken up by antigen presenting cells, processed and presented by human leukocyte antigens (HLA's) class II molecules. This allows T cell help to be given by T cell's specific for carrier
15 derived epitopes to the B cell which is specific for the original antigenic polypeptide/peptide. This can lead to increase in antibody production, secretion and isotype switching.

An adjuvant is a substance or procedure which augments specific immune responses
20 to antigens by modulating the activity of immune cells. Examples of adjuvants include, by example only, agonsitic antibodies to co-stimulatory molecules, Freund's adjuvant, muramyl dipeptides, liposomes. An adjuvant is therefore an immunomodulator. A carrier is an immunogenic molecule which, when bound to a second molecule augments immune responses to the latter.

25

In yet a further aspect of the invention there is provided a method to immunise an animal against a pathogenic microbe comprising administering to said animal at least one polypeptide, or part thereof, according to the invention or the vaccine according to the invention.

30

In a preferred method of the invention said animal is human.

Preferably the vaccine, or antigenic polypeptide, can be delivered by direct injection either intravenously, intramuscularly, subcutaneously. Further still, the vaccine or antigenic polypeptide, may be taken orally.

Preferably the vaccine is against the bacterial species *Staphylococcus aureus*.

- 5 The vaccine may also be against the bacterial species *Staphylococcus epidermidis*.

It will also be apparent that vaccines or antigenic polypeptides are effective at preventing or alleviating conditions in animals other than humans, for example and not by way of limitation, family pets, livestock, horses.

- 10 According to a further aspect of the invention there is provided an antibody, or at least an effective binding part thereof, which binds at least one polypeptide according to the invention.

In a preferred embodiment of the invention said antibody is a polyclonal or monoclonal antibody wherein said antibody is specific to said polypeptide.

15

Alternatively, said antibody is a chimeric antibody produced by recombinant methods to contain the variable region of said antibody with an invariant or constant region of a human antibody.

- 20 In a further alternative embodiment of the invention, said antibody is humanised by recombinant methods to combine the complementarity determining regions of said antibody with both the constant (C) regions and the framework regions from the variable (V) regions of a human antibody.

- 25 Preferably said antibody is provided with a marker including a conventional label or tag, for example a radioactive and/or fluorescent and/or epitope label or tag.

Preferably said humanised monoclonal antibody to said polypeptide is produced as a fusion polypeptide in an expression vector suitably adapted for transfection or transformation of prokaryotic or eukaryotic cells.

Antibodies, also known as immunoglobulins, are protein molecules which have specificity for foreign molecules (antigens). Immunoglobulins (Ig) are a class of structurally related proteins consisting of two pairs of polypeptide chains, one pair of
5 light (L) (low molecular weight) chain (κ or λ), and one pair of heavy (H) chains (γ , α , μ , δ and ϵ), all four linked together by disulphide bonds. Both H and L chains have regions that contribute to the binding of antigen and that are highly variable from one Ig molecule to another. In addition, H and L chains contain regions that are non-variable or constant.

10

The L chains consist of two domains. The carboxy-terminal domain is essentially identical among L chains of a given type and is referred to as the "constant" (C) region. The amino terminal domain varies from L chain to L chain and contributes to the binding site of the antibody. Because of its variability, it is referred to as the
15 "variable" (V) region.

The H chains of Ig molecules are of several classes, α , μ , σ , α , and γ (of which there are several sub-classes). An assembled Ig molecule consisting of one or more units of two identical H and L chains, derives its name from the H chain that it possesses.
20 Thus, there are five Ig isotypes: IgA, IgM, IgD, IgE and IgG (with four sub-classes based on the differences in the H chains, i.e., IgG1, IgG2, IgG3 and IgG4). Further detail regarding antibody structure and their various functions can be found in, Using Antibodies: A laboratory manual, Cold Spring Harbour Laboratory Press.

25 Chimeric antibodies are recombinant antibodies in which all of the V-regions of a mouse or rat antibody are combined with human antibody C-regions. Humanised antibodies are recombinant hybrid antibodies which fuse the complementarity determining regions from a rodent antibody V-region with the framework regions from the human antibody V-regions. The C-regions from the human antibody are also
30 used. The complementarity determining regions (CDRs) are the regions within the N-terminal domain of both the heavy and light chain of the antibody to where the

majority of the variation of the V-region is restricted. These regions form loops at the surface of the antibody molecule. These loops provide the binding surface between the antibody and antigen.

- 5 Antibodies from non-human animals provoke an immune response to the foreign antibody and its removal from the circulation. Both chimeric and humanised antibodies have reduced antigenicity when injected to a human subject because there is a reduced amount of rodent (i.e. foreign) antibody within the recombinant hybrid antibody, while the human antibody regions do not illicit an immune response. This
10 results in a weaker immune response and a decrease in the clearance of the antibody. This is clearly desirable when using therapeutic antibodies in the treatment of human diseases. Humanised antibodies are designed to have less "foreign" antibody regions and are therefore thought to be less immunogenic than chimeric antibodies.
- 15 In another aspect of the invention there is provided a vector which is adapted for the expression of the humanised or chimeric antibodies according to the invention.

In a yet further aspect of the invention, there is provided a cell or cell line which has been transformed or transfected with the vector encoding the humanised or chimeric
20 antibody according to the invention.

In a yet further aspect of the invention there is provided a method for the production of the humanised or chimeric antibody according to the invention comprising :

- (i) providing a cell transformed or transfected with a vector which
25 comprises a nucleic acid molecule encoding the humanised or chimeric antibody according to the invention;
- (ii) growing said cell in conditions conducive to the manufacture of said antibody; and
- (iii) purifying said antibody from said cell, or its growth environment.

30

In a yet further aspect of the invention there is provided a hybridoma cell line which produces a monoclonal antibody as hereinbefore described.

5 In a further aspect of the invention there is provided a method of producing monoclonal antibodies according to the invention using hybridoma cell lines according to the invention.

10 In a further aspect of the invention there is provided a method for preparing a hybridoma cell-line producing monoclonal antibodies according to the invention comprising the steps of:

- i) immunising an immunocompetent mammal with an immunogen comprising at least one polypeptide having the amino acid sequence as represented in SEQ. ID No 14-19, or fragments thereof;
- 15 ii) fusing lymphocytes of the immunised immunocompetent mammal with myeloma cells to form hybridoma cells;
- iii) screening monoclonal antibodies produced by the hybridoma cells of step (ii) for binding activity to the amino acid sequences of (i);
- iv) culturing the hybridoma cells to proliferate and/or to secrete said monoclonal antibody; and
- 20 v) recovering the monoclonal antibody from the culture supernatant.

Preferably, the said immunocompetent mammal is a mouse. Alternatively, said immunocompetent mammal is a rat.

25 The production of monoclonal antibodies using hybridoma cells is well-known in the art. The methods used to produce monoclonal antibodies are disclosed by Kohler and Milstein in Nature 256, 495-497 (1975) and also by Donillard and Hoffman, "Basic Facts about Hybridomas" in Compendium of Immunology V.II ed. by Schwartz, 1981, which are incorporated by reference.

30

In a further aspect of the invention there is provided the use of the antibodies for manufacture of a medicament for the treatment of *Staphylococcus aureus*-associated septicaemia, food-poisoning or skin disorders.

- 5 In another aspect of the invention there is provided the use of the antibodies according to the invention for the manufacture of a medicament for the treatment of *Staphylococcus epidermidis*-associated septicaemia, peritonitis or endocarditis.

10 It will be apparent that the polypeptides identified by the method according to the invention will facilitate the production of therapeutic antibodies to a range of diseases resulting from pathogenic infection, for example, septicaemia; tuberculosis; bacteria-associated food poisoning; blood infections; peritonitis; endocarditis; sepsis; meningitis; pneumonia; stomach ulcers; gonorrhoea; strep throat; streptococcal-associated toxic shock; necrotizing fasciitis; impetigo; histoplasmosis; Lyme disease;
15 gastro-enteritis; dysentery; shigellosis.

As has already been stated earlier, microbial organisms cause a wide variety of diseases. Listed below, and not by way of limitation, are a number of micro-organisms and some of the diseases they cause.

20

Micro-organism	Disease(s) caused
<i>Staphylococcus aureus</i>	Sepsis, food poisoning, septicaemia,
<i>Staphylococcus epidermidis</i>	Peritonitis, septicaemia, endocarditis, other hospital-associated diseases
<i>Enterococcus faecalis</i>	Endocarditis, cystitis, wound infections
<i>Mycobacterium tuberculosis</i>	Tuberculosis
<i>Streptococcus group B</i>	Sepsis, meningitis, pneumonia, bladder infections
<i>Streptococcus pneumoniae</i>	Pneumonia, meningitis
<i>Helicobacter pylori</i>	Stomach ulcers
<i>Neisseria gonorrhoea</i>	Gonorrhoea
<i>Streptococcus group A</i>	Strep throat, necrotizing fasciitis, impetigo, Strep. Toxic shock syndrome
<i>Borrelia burgdoferi</i>	Lyme disease
<i>Coccidiodes immitis</i>	Pneumonia

<i>Histoplasma sapsulatum</i>	Histoplasmosis, pneumonia
<i>Neisseria meningitidis type B</i>	Meningitis
<i>Shigella flexneri</i>	Gastro-enteritis, shigellosis, dysentery
<i>Escherichia coli</i>	Food-poisoning, gastro-enteritis
<i>Haemophilus influenzae</i>	Meningitis, pneumonia, arthritis, cellulitis

An embodiment of the invention will now be described by example only and with
5 reference to the following materials, methods and SEQ ID NO's 1-19 and Table 1.

Materials and Methods

A λ ZAP Express library of genomic DNA of *S. aureus* 8325/4 was used. It contains
10 fragments of 2-10kb from a partial *Sau*3A digest of total genomic DNA. This was
cloned into the *Bam*H1 site of the vector. The library contains >10x coverage of the
genome. The library was probed by plaque lift using an initial screen of
approximately 20,000 plaque forming units on a 9cm diameter Petri dish. The
plating cells used, their treatment, the plating procedure and buffers were exactly as
15 described in the manufacturers handbook (Stratagene). Plating cells, *Escherichia*
coli XL1-Blue MRF', were infected with phage and plated in 3 ml top LB agar
containing 10 mM MgSO₄ onto LB plates containing 10 mM MgSO₄. The plates
were then incubated at 42°C for 4 hr. An 8.5cm diameter nitrocellulose filter disc
(previously soaked in 10 mM IPTG and air-dried) was placed on each plate and its
20 location marked. The plates were then incubated for a further 3.5 hr at 37°C. The
filters were removed and washed in TBST buffer before blocking overnight at 4°C in
TBST containing 6% w/v dried skimmed milk and 3% v/v pig serum (Sigma). The
serum was used to block any Protein A clones on the filter. The filters are then
treated with patient serum (1/5000 dilution) in blocking solution for 90 min at room
25 temperature. Antisera have been obtained from patients convalescing from major *S.*
aureus infections. The filters are then washed for 3x10 min in TBST. Secondary
antibody used was goat anti-human whole IgG alkaline phosphatase linked (Sigma)

at 1/30,000 dilution in blocking solution at room temperature for 30 min. The filters were then washed as above and developed using a standard colorimetric procedure.

5 Cross-reactive plaques were located on the agar plates and cored into 0.2ml phage buffer with 0.02 ml chloroform. The titre of each core stock was determined and the phage plated at approximately 200 plaques per plate. A plaque lift and screen was performed as above to give single, pure cross-reactive clones.

10 The pure clones were then spotted (1µl) onto plates to give a confluent plaque of 0.5cm diameter. 30 individual clones can be spotted on each plate. A plaque lift is performed and the filter probed with an appropriate sera. In this way clones can be tested for their cross-reactivity with other patient sera, non-infected donor sera and anti-Protein A sera.

15 Individual clones were then excised to give a phagemid in *E. coli* XL0LR using the manufacturers protocol (Stratagene). A plasmid miniprep of each was carried out and the size of the genomic insert determined by restriction mapping. The identity of the cloned insert was determined by DNA sequencing using primers against vector sequence, which allows sequencing across the insert. By comparison of the derived
20 sequence against the public domain databases the nature of the cloned gene(s) can be determined.

Hybridisation Solutions/Conditions

25 Typically, hybridisation conditions uses 4 – 6 x SSPE (20x SSPE contains 175.3g NaCl, 88.2g NaH₂PO₄ H₂O and 7.4g EDTA dissolved to 1 litre and the pH adjusted to 7.4); 5-10x Denhardts solution (50x Denhardts solution contains 5g Ficoll (type 400, Pharmacia), 5g polyvinylpyrrolidone abd 5g bovine serum albumen; 100µg-
30 1.0mg/ml sonicated salmon/herring DNA; 0.1-1.0% sodium dodecyl sulphate; optionally 40-60% deionised formamide. Hybridisation temperature will vary

depending on the GC content of the nucleic acid target sequence but will typically be between 42⁰- 65⁰ C.

5

10

Staphylococcus aureus clones identified in human sera screen

TABLE 1

Patient Sera	Clone	Encoded proteins	Locus number
A	1	γ hemolysin B and C subunit	1
A	3	Atl	2
A	4	γ hemolysin B and C subunit	1
A	5	γ hemolysin B and C subunit	1
A	7	Novel putative protease (ORF1 novel antigen like)	7
A	8	Novel nuclease (YisK)	5
A	9	Novel autolysin	6
A	10	γ hemolysin B and C subunit	1
A	11	Atl	2
A	14	γ hemolysin B and C subunit	1
A	15	γ hemolysin B and C subunit	1
A	S1	Novel putative protease (ORF1 novel antigen like)	7
A	S5	Novel surface protein	12
A	S17	γ hemolysin B and C subunit	1
A	S18	Novel putative protease (ORF1 novel antigen like)	7
A	S19	Novel autolysin	6
A	S20	Novel surface protein/toxin	13
A	S21	γ hemolysin B and C subunit	1
A	S25	γ hemolysin B and C subunit	1
A	S29	Fibrinogen binding protein)	3
A	S44	Novel surface protein	12
A	S45	Atl	2
A	S55	Atl	2
A	S64	Atl	2
A	S66	Atl	2
B	2	Novel exotoxin (exotoxin 2 like)	8
C	1	Coagulase	4
C	2	Coagulase	4
C	3	Coagulase	4
C	4	Coagulase	4
C	5	Coagulase	4
C	6	Coagulase	4
C	7	Coagulase	4
C	8	Coagulase	4
C	9	Coagulase	4
C	10	Coagulase	4

C	11	Coagulase	4
C	13	Coagulase	4
C	14	Coagulase	4
C	15	Coagulase	4
C	19	Coagulase	4
C	20	Coagulase	4
C	25	Coagulase	4
E	6	Novel surface proteins	9/10
E	7	Novel surface proteins	9/10
E	11	γ hemolysin B and C subunit	1
F	1	Novel exotoxin (exotoxin 2 like)	8
F	2	Novel exotoxin (exotoxin 2 like)	8
F	3	Novel exotoxin (exotoxin 2 like)	8
F	4	Novel exotoxin (exotoxin 2 like)	8
F	5	Novel hemolysin (Yjfd)	11

CLAIMS

1. An isolated nucleic acid molecule comprising a DNA sequence selected from
5 the group consisting of:

- (i) the DNA sequence as represented in SEQ ID NO's 1 – 13;
- (ii) DNA sequences which hybridise to the sequence presented in the SEQ
10 ID No's 1-13 identified in (i) above and which encode a polypeptide
expressed by a pathogenic organism; and
- (iii) DNA sequences which are degenerate as a result of the genetic code to
the DNA sequences defined in (i) and (ii).

15

2. An isolated nucleic acid molecule according to claim 1 which is genomic
DNA.

3. An isolated nucleic acid molecule according to claim 1 or 2 which anneals
20 under stringent hybridisation conditions to the sequences presented in SEQ ID
NO's 1-13.

4. A vector comprising a nucleic acid molecule according to any of claims 1-3.

25 5. A vector according to claim 4 wherein the vector is adapted for recombinant
expression of the polypeptide encoded by the nucleic acid.

6. A vector according to claim 4 or 5 wherein said vector is an expression vector
adapted for prokaryotic gene expression.

30

7. A vector according to claim 4 or 5 wherein said vector is an expression
vector adapted for eukaryotic gene expression.

8. A vector according to any of claims 4 to 7 wherein the adaptation of the vector includes the provision of promoter sequences.
- 5 9. A vector according to claim 8 wherein the promoter sequences provide for cell specific, inducible or constitutive expression.
10. A method to identify antigenic polypeptides comprising:
- 10 (i) providing a nucleic acid library encoding genes or partial gene sequences of a pathogenic organism;
- (ii) transforming/transfecting said library into a host cell;
- 15 (iii) contacting the polypeptides expressed by the genes/partial gene sequences with autologous antisera derived from an animal infected with, or has been infected with, said pathogenic organism; and
- (iv) purifying the nucleic acid encoding the polypeptide or partial polypeptide
20 binding to said autologous antisera.
11. A method according to claim 10 wherein said library comprises genomic DNA of a pathogenic organism.
- 25 12. A method according to claim 10 or claim 11 wherein said pathogenic organism is bacterial.
13. A method according to any of claims 10 to 12 wherein said bacterial organism is selected from the following: *Staphylococcus aureus*; *Staphylococcus epidermidis*; *Enterococcus faecalis*; *Mycobacterium tuberculosis*;
30 *Streptococcus group B*; *Streptococcus pneumoniae*; *Helicobacter pylori*;

Neisseria gonorrhea; Streptococcus group A; Borrelia burgdorferi; Coccidioides immitis; Histoplasma sapsulatum; Neisseria meningitidis type B; Shigella flexneri; Escherichia coli; Haemophilus influenzae

- 5 14. A method according to any of claim 13 wherein said pathogenic organism is *Staphylococcus aureus*.
15. A method according to any of claim 13 wherein said pathogenic organism is *Staphylococcus epidermidis*.
- 10 16. A method according to any of claims 10 to 15 wherein said nucleic acid library is a lambda library.
17. A polypeptide identified by the method according to any of claims 10 to 16.
- 15 18. A polypeptide according to claim 17 which is selected from the group consisting of SEQ ID NO's: 14-19.
19. A method for the production of the polypeptides according to any of claims 17 or 18 comprising:
- 20 (i) providing a cell transformed/transfected with a vector according to any of claims 4 to 9 and with cell culture conditions; and
- (ii) purifying said polypeptide from said cell, or its growth environment.
- 25 20. A method according to claim 19 wherein said vector encodes, and thus said recombinant polypeptide is provided with, a secretion signal to facilitate purification of said polypeptide.
- 30 21. A cell transformed or transfected with the vector according to any of claims 4 to 9.

22. A cell according to claim 21 which is a prokaryotic cell.
23. A cell according to claim 21 which is a eukaryotic cell selected from the group consisting of: fungal cell, insect cell, amphibian cell; mammalian cell;
5 plant cell.
24. A vaccine comprising at least one polypeptide according to claims 16 or 17.
25. A vaccine according to claim 24 which further comprises a carrier and/or
10 adjuvant.
26. A method to immunise an animal against a pathogenic microbe comprising administering to the animal at least one polypeptide, or part thereof, according to any previous claim or the vaccine of any previous claim.
15
27. A method according to claim 26 wherein the animal is human.
28. A method according to claim 26 or 27 wherein the vaccine, or antigenic polypeptide, is delivered by direct injection either intravenously, intramuscularly or
20 subcutaneously.
29. A method according to claim 25 or 26 wherein the vaccine or antigenic polypeptide is taken orally.
30. A method according to any of claims 26 to 29 wherein the vaccine is against the bacterial genus *Staphylococcus spp.*
- 25 31. A method according to claim 30 wherein the vaccine is against the bacterial species *Staphylococcus aureus*.
32. A method according to claim 30 wherein the vaccine is against the bacterial species *Staphylococcus epidermidis*.

33. An antibody, or at least an effective part thereof, which binds at least with a selective part of the polypeptide according to claim 16 or 17.
34. An antibody according to claim 33 which is a monoclonal antibody.
- 5 35. An antibody according to claim 33 or 34 wherein said effective part comprises FAb fragments.
- 10 36. An antibody according to any of claims 33 to 35 which is a chimeric antibody.
37. An antibody according to any of claims 33 to 35 which is a humanised antibody.
- 15 38. An antibody according to any of claims 33 to 37 wherein said antibody is provided with a marker, label or tag.
- 20 39. An antibody according to claim 38 wherein said antibody is provided with a marker selected from a group consisting of: a radioactive label, a fluorescent label; an epitope tag.
40. An antibody according to any of claims 34 to 39 which is produced as a fusion polypeptide.
- 25 41. A vector which is adapted for the expression of the antibodies according to any of claims 34-40.
42. A cell which has been transformed or transfected with the vector according to claim 41.

30

43. A method for the production of the antibody according to any of claims 34 or 40 comprising :
- 5 i) providing a cell transformed or transfected with the vector according to claim 41 and with cell culture conditions; and
- ii) purifying said antibody from said cell, or its growth environment.
44. A hybridoma cell line which produces an antibody according to claim 34.
45. Use of the antibodies according to any of claims 33 to 40 for the manufacture
10 of a medicament for the treatment of *Staphylococcus aureus*-associated septicaemia, food-poisoning or skin disorders.
46. Use of the antibodies according to any of claims 33 to 40 for the manufacture of a medicament for the treatment of *Staphylococcus epidermidis*-associated
15 septicaemia, peritonitis or endocarditis
47. A method for preparing a hybridoma cell-line producing monoclonal antibodies according to claim 34, comprising the steps of:
- 20 i) immunising an immunocompetent mammal with an immunogen comprising at least one polypeptide having the amino acid sequence as set forward in SEQ ID No: 14-19, or fragments thereof;
- ii) fusing lymphocytes of the immunised immunocompetent mammal with myeloma cells to form hybridoma cells;
- 25 iii) screening monoclonal antibodies produced by the hybridoma cells of step (ii) for binding activity to the amino acid sequences of (i);
- iv) culturing the hybridoma cells to proliferate and/or to secrete said monoclonal antibody; and
- v) recovering the monoclonal antibody from the culture supernatant.
- 30 48. A method according to claim 47, wherein said immunocompetent mammal is a mouse

49. A method according to claim 47, wherein said immunocompetent mammal is
a rat

5

10

SEQUENCE LISTING

<110> University of Sheffield

5 <120> Antigenic Peptides

<130> toxin

<140>

10 <141>

<160> 32

<170> PatentIn Ver. 2.1

15 <210> 1

<211> 2260

<212> DNA

<213> Staphylococcus aureus

20 <400> 1

gatcttaatg aaagagtgac tgatgcctta gcaattgcta gttgtatcaa tgcgcatccg 60

tatgtcaaag gagaactttg cgtgtccgat gacttaacgt atacgacagg ttattttgcc

120

25 gctgctaaaa ttggttacca tcgattatth gatattaaac cagttaatac gagatatgga

180

ggcagaataa tatttgtgga cgattgtatt gatttaaate attacatate atttttagaa

240

agcacaccga agcaagttgt ttatgaaacg gtataggggt tttagtatga catcaaaaga

30 300

tattactcaa attagtgtca ttgctgcgat ttttaaccatt ttggcagttt tgaaaatacc

360

gtccattata ccaggattag attttcaatt atctgcaccg gcagcattat tgatattagc

420

35 tttcttttga attaaaaagt acttttttagg tggattatta tctagcctat tattactagt

480

atttggcgta tttaatccaa ttaatgtgat tatctctatt atatttagag ttatagctat

540

tgcagttggt tatttattga aaataaatgt actatcatta gtttttagcaa gtgtattagg

40 600

cagtttggtt tataggctac tattatctat tattttaaat ttacctgtgt gggtagtggt

660

gttaaaccg agttccaggcg taatattcac ttttaattgta gctattcctt tatactcac

720

45 attgagaaaa agaattggcag tattactaag ataataaate aaaacacggg cgtcacaatt

780

actgttggcg accgtgtttt actagctatt tattgttttc agtttctttt gtatctaaca

840

atttcacttt gtgattttcc caatcaattt catatgttga tttaaatggt ctagttttta

50 900

agtttttata atttgcgcct gccagtaga agccattcca acgaatttgg tataaatcca

960

tttcacgttg ataagttact gtaattttag atttttttagc gccatcttgt ctgtgtgata

1020

55 gtacgcttaa aaattctgga ttgaagttac ttctagataa taatggcatt tgggtgttgcg

1080

ctatgaagtt ttggccagcg tatgcactgc tttgtctgcc agctaagaag agttcattac

1140

catatgttgg gtggaagcta tctcttccat aagggtccca accattatcc ataattttat

60 1200

gtgcttcaac tccccagcca acatttttat aatttgtgtt gcgacttaat gttgttctgt

1260

aactttcttg tttataatta attgtttcag aaaaagctgt atttccatta agtccaccag
 1320
 ataaaccatt agagatacta atgtcaccac caaatgtata gcctaaagta ttttgaactt
 1380
 5 gaaactcttc attttgattt tttggtgcat aatcaacgac gtttactgaa tcattagatt
 1440
 gtgagcttat agatacattg tatttagctc cccaatataa ttttgaaaag tcatagtcac
 1500
 10 taggattagg tttcacaaag cctgagttta tattcccagt agctttaagt actaaagtat
 1560
 ctttatcata acttttatct ttgatgaaat taaatgttaa aatctgtgaa attttaaatt
 1620
 tatcagaatc tgctgtggct gttgttttgt ataaagtaac tttgtcatcg acttttttta
 1680
 15 cgctgactgg tggtatttta ctttcagcat tagcagtacc agaaagtaat aataatgcca
 1740
 tagatgtagc aacggatgat ttgactaatt tattcatttt catatcaatt ctgtcctttc
 1800
 20 accttgattt catgagtctt ccaattgacc tcgtatttca cagtatagtt tctatttaca
 1860
 aatgcattat ggactctatg tccgtctaaa taactgttgc cataatgcgt tgatctttta
 1920
 atggcatgag tgacatccat gtttcttcog taagtaattt caaattegct tgtatcgctt
 1980
 25 gaaccttttt catgagatac tgtggcgata aatgaagggt taaatccact ttgtacaaga
 2040
 ggtggtaact cactgtctgg aacgaaataa tctctaggat ctttactatg aggtttgtag
 2100
 30 cctacaaata aatcgctatc aaaggctgat ttttgacctg attcagtggc gaatgaattc
 2160
 gctttgacgc cccataaaac actttttgag ttttgttgtt ctacttcaact tacataattt
 2220
 tgttggttat agctaatacga tttagaatag tttaatgatc
 2260
 35
 <210> 2
 <211> 2902
 <212> DNA
 40 <213> Staphylococcus aureus
 <400> 2
 gatcgtataa tcgaaacagc accaacggat tacttatctt ggggtgtcgg tgcagtcggt 60
 45 aaccctagat tcatcaatgt tgaaatcgta cacacacacg actatgcttc atttgcacgt
 120
 tcaatgaata actatgctga ctatgcagct acacaattac aatattatgg tttaaaacca
 180
 gacagtgttg agtatgatgg aaatggtaca gtatggactc actacgctgt aagtaaatat
 240
 50 ttaggtggta ctgaccatgc cgatccacat ggatatttaa gaagtcataa ttatagttat
 300
 gatcaattat atgacttaat taatgaaaaa tatttaataa aaatgggtta agtggcgcca
 360
 55 tggggtacgc aatctacaac taccctact acaccatcaa aaccaacaac accgtcgaaa
 420
 ccatcaactg gtaaattaac agttgctgca aacaatggtg tcgcacaaat caaaccaaca
 480
 aatagtgggt tatatactac tgtatacgac aaaactggta aagcaactaa tgaagttcaa
 540
 60 aaaacatttg ctgtatctaa aacagctaca ttaggtaatc aaaaattcta tcttgttcaa
 600
 gattacaatt ctggtaataa atttggttgg gttaaagaag gcgatgtggg ttacaacaca
 660

gctaaatcac ctgtaaagt aaatcaatca tattcaatca aacctggtac gaaactttat
 720
 acagtacctt ggggtacatc taaacaagtt gctggtagt tgtctggctc tggaaaccaa
 780
 5 acatttaagg cttcaaagca acaacaaatt gataaatcaa tttatttata tggctctgtg
 840
 aatggtaaat ctggttgggt aagtaaagca tatttagttg atactgctaa acctacgcct
 900
 10 acaccaacac ctaagccatc aacacctaca acaataata aattaacagt ttcattatta
 960
 aacggtgttg ctcaaattaa tgctaaaaac aatggcttat tcaactacagt ttatgacaaa
 1020
 actggttaagc caacgaaaga agttcaaaaa acatttgctg taacaaaaga agcaagttta
 1080
 15 ggtggaaaca aattctactt agttaagat tacaatagtc caactttaat tgggtgggtt
 1140
 aaacaaggtg acgttattta taacaatgca aaatcacctg taaatgtaat gcaaacatat
 1200
 20 acagtaaaac caggcactaa attatatcca gtaccttggg gcacttataa acaagaagct
 1260
 ggtgcagttt ctggtacagg taoccaaact tttaaagcga ctaagcaaca acaattgat
 1320
 aaatctatct atttatttgg aactgtaa atgtaaactctg gttgggtaag taaagcatat
 1380
 25 ttagctgtac ctgctgcacc taaaaaagca gtagcacaac caaaaacagc tgtaaaagct
 1440
 tatactgtta ctaaaccaca aacgactcaa acagtttagc agattgctca agttaaacca
 1500
 30 aacaacactg gtattcgtgc ttctgtttat gaaaaaacag cgaaaaacgg tgcgaaatat
 1560
 gcagaccgta cgttctatgt aacaaaagag cgtgctcatg gtaatgaaac gtatgtatta
 1620
 ttaaacaata caagccataa catcccatta ggttggttca atgtaaaaga cttaaagtgt
 1680
 35 caaaacttag gcaaagaagt taaaacgact caaaaatata ctgttaataa atcaaataac
 1740
 ggcttatcaa tgggttccttg ggtactaaa aaccaagtca ttttaacagg caataacatt
 1800
 40 gctcaaggta catttaatgc aacgaaacaa gtatctgtag gcaaagatgt ttatttatac
 1860
 ggtactatta ataaccgcac tgggtgggta aatgcaaaag atttaactgc accaactgct
 1920
 gtgaaaccaa ctacatcagc tgccaaagat tataactaca cttatgtaat taaaaatggt
 1980
 45 aatgggtatt actatgtaac accaaattct gatacagcta aatactcatt aaaagcattt
 2040
 aatgaacaac cattcgcagt tgtaaagaa caagtcatta atggacaaac ttggtactat
 2100
 50 ggtaaattat ctaacggtaa attagcatgg attaaatcaa ctgatttagc taaagaatta
 2160
 attaaagtata atcaaacagg tatggcatta aaccaagttg ctcaaataca agctgggtta
 2220
 caatataaac cacaagtaca acgtgtacca ggtaagtga caggtgctaa ctttaatgat
 2280
 55 gttaagcatg caatggatac gaagcgttta gctcaagatc cagcattaaa atatcaattc
 2340
 ttacgcttag accaaccaca aatatattct attgataaaa ttaatcaatt cttaaaaggt
 2400
 60 aaagggtgat tagaaaacca aggtgctgca tttaacaaag ctgctcaaat gtatggcatt
 2460
 aatgaagttt atcttatctc acatgcccta ttagaaacag gtaacggtac ttctcaatta
 2520

gcgaaagggtg cagatgtagt gaacaacaaa gttgtaacta actcaaacac gaaataccat
 2580
 aacgtatttg gtattgctgc atatgataac gatcctttac gtgaagggtat taaatatgct
 2640
 5 aaacaagctg gttgggacac agtatcaaaa gcaatcggtg gtggtgctaa attcatcggc
 2700
 aactcatatg taaaagctgg tcaaaataca ctttacaaaa tgagatggaa tcctgcacat
 2760
 10 ccaggaacac accaatatgc tacagatgta gattgggcta acatcaatgc taaaatcatc
 2820
 aaaggctact atgataaaaat tggcgaagtc ggcaaatact tcgacatccc acaatataaa
 2880
 taagcaacat gaacatagga tc
 2902
 15
 <210> 3
 <211> 2792
 <212> DNA
 20 <213> Staphylococcus aureus
 <400> 3
 gatcaactta atataatgaa ttcggcaaca gaagagcatc atcataaaga ttatatataa 60
 25 ctatataatt taggtggcgg tgctgctaaa aaaattgcaa tagaggtttt attggggaag
 120
 gataaagtca ttcagaaaaa atacgtgcat attttaccta gttaaagaagg gtacatgtta
 180
 ccaattaata aaaatgtgta cgaagaatta gaaagaacga ttgagaacaa tggatcatgaa
 240
 30 gctgatttga atgtacgtat gacttattat cataatgtaa gtcgcaaaca acaggaagtt
 300
 atattaaaag gtcaaatacg cggttttaat acttataata ataaagaaat ttatgatttg
 360
 35 cagtttatct aaaaattgat ttaagagggt agttgtttat tgcgaaaaat atcattcaat
 420
 tttaatgaaa taatggcgtc attactataa aatattactt tatgttgtaa tgcatttttc
 480
 tataagatag aactaaaagg aggggcaaag atgcaaatta gacaaataca tcaacatgac
 540
 40 tttgctcaag tggaccagtt aattagaacg gcatttgaaa atagtgaaca tggttatggt
 600
 aatgaatcag agctagtaga ccaaattcgt ctaagtgata cgtatgacaa taccttagaa
 660
 45 ttagtagctg ttcttcaaaa tgaagttgta gggcacggtt tactaagtga agtttatctt
 720
 gataacgagg cacaacggga aattggatta gtgttagcac ctgtatctgt tgatattcat
 780
 catcaaaata aaggatttgg gaagcgattg attcaagcat tagaacgaga agcaatatta
 840
 50 aaaggatata attttatcag tgtattagga tggccgacgt attatgcaa tctaggatat
 900
 caacgcgcaa gtatgtacga catttatcca ccatatgatg gtataccaga cgaagcggtt
 960
 55 ttaattaaag aattaaaagt gaacagttta gcgggaaaaa caggtacat aaattacaca
 1020
 tctgcttttg aaaaaatatg atttcaagct aggattacat taggtagagt tcatattaat
 1080
 aataaaaaat gtttgcaatc aaatcgtagc ttgtcggttg taattcttaa aatagcaata
 1140
 60 aataaaatgt ttgttagtaa agtattattg tggataataa aatatcgata caaattaatt
 1200
 gctataatgc aatttttagtg tataattcca ttaacagaga ttaaataatat ctttaaaggg
 1260

tatatagtta atataaaatg acttttttaa aagagggaat aaaatgaata tgaagaaaa
 1320
 agaaaaacac gcaattcgga aaaaatcgat tggcgtggct tcagtgcttg taggtacgtt
 1380
 5 aatcggtttt ggactactca gcagtaaaga agcagatgca agtgaaaata gtgttacgca
 1440
 atctgatagc gcaagtaacg aaagcaaaag taatgattca agtagcgtta gtgctgcacc
 1500
 10 taaaacagac gacacaaacg tgagtgatac taaaacatcg tcaaacta ataatggcga
 1560
 aacgagtgtg gcgcaaaatc cagcacaaca ggaaacgaca caatcatcat caacaaatgc
 1620
 aactacggaa gaaacgccgg taactgggtga agctactact acgacaacga atcaagctaa
 1680
 15 tacaccggca acaactcaat caagcaatac aaatgcggag gaattagtga atcaaacaag
 1740
 taatgaaacg acttctaata atactaatac agtatcatct gtaaattcac ctcaaaattc
 1800
 20 tacaatatgc gaaaatgttt caacaacgca agataactca actgaagcaa caccttcaa
 1860
 caatgaatca gctccacaga gtacagatgc aagtaataaa gatgtagtta atcaagcgg
 1920
 taatacaagt gcgcctagaa tgagagcatt tagtttagcg gcagtagctg cagatgcacc
 1980
 25 ggcagctggc acagatatta cgaatcagtt gacgaatgtg acagttggta ttgactctgg
 2040
 tacgactgtg tatccgcacc aagcagggtta tgtcaaactg aattatgggt tttcagtgc
 2100
 30 taattctgct gttaaagggtg acacattcaa aataactgta cctaaagaat taaacttaa
 2160
 tgggtgtaact tcaactgcta aagtgccacc aattatggct ggagatcaag tattggcaa
 2220
 tgggtgtaatc gatagtgatg gtaatgttat ttatacattt acagactatg taaatactaa
 2280
 35 agatgatgta aaagcaactt tgaccatgcc cgcttatatt gaccctgaaa atgttaaaaa
 2340
 gacaggtaat gtgacattgg ctactggcat aggtagtaca acagcaaaca aaacagtatt
 2400
 40 agtagattat gaaaaatatg gtaagtttta taacttatct attaaaggta caattgacca
 2460
 aatcgataaa acaataata cgtatcgtca gacaatttat gtcaatccaa gtggagataa
 2520
 cgttattgcg ccggttttta caggtaattt aaaaccaaat acggatagta atgcattaat
 2580
 45 agatcagcaa aatacaagta ttaaagtata taaagtagat aatgcagctg atttatctga
 2640
 aagttacttt gtgaatccag aaaactttga ggatgtcact aatagtgtga atattacatt
 2700
 50 cccaaatcca aatcaatata aagtagagtt taatacgcct gatgatcaaa ttacaacacc
 2760
 gtatatagta gttgttaatg gtcattattga tc
 2792

55 <210> 4
 <211> 2478
 <212> DNA
 <213> Staphylococcus aureus

60 <400> 4
 gatcgaattg aacgaagcat ttgcttctca aacgattgca tctattaaag aagtaggtct 60
 agatatatca cgtacgaatg tgaatgggtg cgctattgct ttaggtcatc cattaggtgc
 120

tacaggcgca atgttaaccg cgcgtttact taatgaaatg ggtagacgtc ccgatagccg
 180
 ttacggcatg gttacgatgt gtattggtgt cggcatgggt gcagctgcta tatttgaata
 240
 5 tgtgcgttag aatggttgat tttggatgaa gcggattcgt tttgttattg aatgaagtag
 300
 gctgaagttg aagccagttg aagttgaagc gggttgaagc aatttcgttt tattaatgaa
 360
 10 gctgtgtgaa atatagtgat tgaacaaaaa agtggtttaa tgggatgggtg gttatttccg
 420
 ttttagaatt taacatttac acgtctaatt ttaatcattg ttttaaattt tatgaatcga
 480
 agccctttga ttttaataata tttgctaatt ctagtaactt atctgattgt tcatgtttaa
 540
 15 aataaagaaa accactcaca tcagtgtgtg ttcgaactag acttgtaagt tccagttcgg
 600
 cacgactttc taaagcaatt attattgctg tgattgtcgt atatcactta gatgtgcgtg
 660
 20 gtttatttta ataggtttagt aatatattag gtcatgttat gtttaagact ataatgaata
 720
 aataatttag aaatatgctt ccgattgttc gatgctttaa ttcagttaga agcatcatag
 780
 aatgcatgat tactgttgta aagatacgta atgttttgta ttgactgtat gtctttggat
 840
 25 agagttacaa acttattttg ttactctagg cccatatgtc gcagtacat ctgcatgtgt
 900
 tgttacattg tatgcatttg ttttacttgg cttcttgat gtcgggagag ctccgtatga
 960
 30 cacttgaccg tttgcatgtg ttgttacgtt gtatgcattt gttttgcttg gcttgttttg
 1020
 tgttgggcga gcgccatatg atacttgcc gtttccatgt gttgttacgt tatatgcgtt
 1080
 tgttttgctt ggcttgtttt gtgtcggacg agctccgtat gatacttggc cgtttgcatg
 1140
 35 tgttgttaca ttgtatgcat tcgtttcgtt tggcttcttg tatgtcggac gagctccgta
 1200
 tgatacttga ccatttgcat gtgttggttac gttatatgca tttgtttctg atggcttatt
 1260
 40 gaatcttggg ctgccttcat atccaaatgt tccatcggtg tattcacgga tacctgtacc
 1320
 agcatctcta tatttaacat atttaggtgt tttgttaaatt tgcggctctg gaccatattg
 1380
 agaagcttct gttgtttcag ttgcttgagg ttttaacttca atatcacttg attctccttg
 1440
 45 agtacctttt aacgttgatt cagtaccttg tggttttatt tcaagtttag atgagctacc
 1500
 ttcaagacct tctaaaatag gggttcgttaa cgggtgggtt gtataattat tgcttaatga
 1560
 50 tgggcccgtt tgttccattg ttagaaaatc gggaccttga acgatttcac cttgtaccgt
 1620
 tttattttcc atcgttggtt attccggacc ttttacaatt tcacctgtaa ttgtgccctg
 1680
 tggaatttta actaatggtt gtgcaactgg ttgtgttggt tcttcagctt taccagccgt
 1740
 55 agttttaacc tcttgttggt tatcaacttt aggtgcttga ggttcttcaa ctttcttctc
 1800
 ttcttttact actggcgatt ttgtttcagt ttctccgtat tttttgacag ttttcttttt
 1860
 60 ccaagaatca tctgcttctt taactgcttt tttegtttct tcaactaatt tatcaaaatt
 1920
 aggtttatta tcaactattg ttttatagtt atgtgttgta ggattatatt tcgttataga
 1980

tttcgggtcta ttttgtttag tttccataaa gaaatcatca ataattgaat ttaagtcac
 2040
 aatcatttct tttttaatac gttcatttgt aattttatgt ggattgtctg tatctccaag
 2100
 5 gattaagtcc agttttgctc gtaactcttt cgcgtgctcc ccataatcct tatcaccata
 2160
 atatgataca actaatgtat caatttcaga tacgagatcg tatacttctt tagttgcttt
 2220
 10 atcttcttct gctgcattaa aagttttcaa gtctgaattc ttatccttaa tatctttaac
 2280
 ttctctgtga aaatcatcca gtgctctctt taatgcatcc tgtagttcat tgtattcttt
 2340
 catcgaaagt tcttctaaat tatatttatg aaaattagcc atttttaaat ctgtacgagg
 2400
 15 attttctttt ttataatttg cataccattg tttataatct tcatattgag atttctttct
 2460
 ctccaaaaga tattgato
 2478
 20
 <210> 5
 <211> 2070
 <212> DNA
 <213> Staphylococcus aureus
 25
 <400> 5
 tgacgtgct tttgtaaata catataattt ttccacttca tgatttaatt cgttcgcatg 60
 atctttgtaa tttctaccaa aagcaatcac attattcgga ggtgttactg gtggtaaaaa
 120
 30 ttcaatgtca ttaaatgaaa ttttatagtc ttcagctttg ccgctatctt ctgctgctac
 180
 aactgcttta cgtacttggt cttgaaaatc taaagtatga ttttgttgta aaccagctaa
 240
 caatgtttta ggatggaaat ctcttctgca aaagtcagca aatacttggt ttaaatccca
 35 300
 tacagcatct tcgcgtttta ctttaacgcc atatgaagtt ttgtcattat acttgaatga
 360
 taagaatttc attcattctc aactcctcgt ctttatctta attcacatta taactttttt
 420
 40 cgttatcaaa taacaaataa ataagtaaga caattttgaa aatgagttgt gttcattctg
 480
 ctacaaggac ttgcaactta atcgaaatta ttttttattc ttttgaaaat caaaatacta
 540
 tagttgcaat gtaccaaatt tgaagaagta taaataacct ttaacttctt tattaagaat
 45 600
 cgtttgaagc gtattttgat aatatttcat ctgtatctta tatttatttt ttaattgtgt
 660
 accaatttct tcatctgtca tcccacggcg acgattaaat gcatcggttt tatagtctac
 720
 50 aaaataatgc acaccatctt taacaaagat taagtcaatc ataccttgaa taattgagac
 780
 gtcttcgtct ccttgtggca attggtcaac taatgcttgg ttaactacaa acggtaatc
 840
 acgataaact tgctctgctt cagcaataat cgaatataac tcactattga taaatgtcat
 55 900
 tatttcatcc atacggatat cttttttcgc atctgcttcg ataatatgtt tatcgattaa
 960
 tccatcgata tactgatgta actcaacttc agatatgcgt tcttttttga atggtaaattg
 1020
 60 ttgcatcact gtatgcatta acgtaccaat ttcattcgct tttcgtttac cttgttcact
 1080
 tagaaattta ggtcgttcat acgttgaaaa accgatacga tattgcotta ctcgttcgta
 1140

acttgtgcca ctttcttctg tttcatattg tcttttcaat tcagaaacag attgttttga
 1200
 gggcttttta gtatcattta catatggata tcgataatca agttggtggt taatttgtgc
 1260
 5 ttttaacatct tcattaccat tttgcatagt ttctaattga ttaaccgaac gatattcatc
 1320
 attatctaaa atggtttctg tagacacatc ttcaaagtac acaattgaaa tatttacatt
 1380
 10 cggacgacta ctatcttcaa tttgtgctat atctttttca aatttttaaat catctggaat
 1440
 tgacgcagat tgatgttttag ataaaatact ataaataaga tggaacggat ttggtgaagt
 1500
 taatcgttca ttgacagcaa tgtgctcacc agaaatagac aattgctcta gttctagtaa
 1560
 15 tgatttatca tttttcactc taccaattaa ataaagttgt tctttcgctc ttgttaatgc
 1620
 tacatagact aatcgcatth cttctgacac aagttctttt tcggcaacag ctctatatgc
 1680
 20 aaccgaagct aaagatggaa atgccatttc tttatccaca tcaaaataat ccattccgag
 1740
 accaaattgc tgatttaaaa taactgggtg tttcaaatac cgtttattaa aatcttttga
 1800
 caatccagaa taaatgacaa atggaaactc tagacctta ctactatgaa ttgtcatcat
 1860
 25 tctaacgaca ttatcgtttg gaccaactac attttcctca ccaaaatctt tgcctctttc
 1920
 aatcaattca tcgataaaac gaataaattg atataaacct ctaaaacttg aattctcaaa
 1980
 30 ctcgatagct ttattaaata aaccataaag atttgcacgt cgtccacgtc caccaataag
 2040
 tccactaaag tattgaataa cataatgatc
 2070

 35 <210> 6
 <211> 2394
 <212> DNA
 <213> Staphylococcus aureus

 40 <400> 6
 gatcagattt attagacagt attccagata taccacacc aaagccagaa aagacgttaa 60
 cacttggtaa aggtaatgga ttgttaagtg gattattaaa tgctgatggt aatgtatctt
 120
 tgcctaaagc gggggaaacg ataaaagaac attggttgcc gatatctgta attgttggtg
 45 180
 caatgggtgt actaatgatt tggttatcac gacgcaataa gttgaaaaat aaagcataat
 240
 tatattgggg gaagagcatc tataatatttt ttttaagtata taagacgtct tatttcccct
 300
 50 taattttattg tgaagtatat gcaaaatgca atgaatagat tgtccatcat tttaacgtta
 360
 taatgaattt aacgacttag aactacacaa gtaaaggaga atgaagatgt ctcgaaaaac
 420
 ggcgctatta gttttggata tgcaagaagg tatagcgagt agtgtacct gaataaaaaa
 55 480
 tattattaaa gcgaatcaga gagcaattga agcagcaaga caacatcgaa taccagtcac
 540
 tttcatacgt ttagtggttag ataagcattt taatgatgtc tcctcgagta ataaagtgtt
 600
 60 ttcaacaatt aaagctcaag gatatgcgat tactgaagca gatgcaccta cacgaatact
 660
 tgaagattta gcaccactag aagatgagcc gattatttct aagcgacgct ttagcgcat
 720

tacaggtagt tacttggaag tttatttacg tgcaaagatg attaatcatt tagtattaac
 780
 ggggtgtctct acaagtggag ctgtattgag cacggcatta gaaagtgtag ataaagacta
 840
 5 ttatattact gttttagaag atgctgttgg tgatagatca gatgataaac atgactttat
 900
 tattgaacaa attttatcac gctcatgtga cattgaatcc gtagagtcat ggaaaagtag
 960
 10 tttatagtta atataacgtc aattaaagct cggcagtaat gtttgagaat aagtacattt
 1020
 gctcatattt ataaaatgtg tgagatggca attgaaacgg atatgatgag gaacatttga
 1080
 acataaaaata atatatttat ataaaacgac ccgaggcggt cgaactgaat gcctcggggt
 1140
 15 taattgaata agaaatcgga cttatgaaca gaaatatgtt taagtccgaa ctccttggtt
 1200
 atacttataa attttacggg tttaatataa tacttattta cctgtaatat atgataattc
 1260
 20 ttcagcggca gctgcgttga tagttctatg agaaatgata cctaatacctt taacattgga
 1320
 ttctgaaata acgatagaac catcactgtt aactttttca acaaagcta catgaccgta
 1380
 atgttgatct gcaccaaatt gtccagcctc aaatacaaca gcagcatgac gttttgggtg
 1440
 25 atgacttact tgataatcac ggtattgagc tcgattattc caattatgtg catcacctaa
 1500
 atcacctgag atagatgtac caaattgttt catacgggta tatacgtacc aagtacattg
 1560
 30 gccatgtgga tatggcatac tatcagatac ctcacggaaa ggtttgaatt catctgatga
 1620
 atcatcataa tccttgatag aacgttcata tttatctaaa tctggcatgc gttcatcgtc
 1680
 aaactgagtt aattgatagt gtttaataat actgtttaat ttcttagcat agtttggatc
 1740
 35 tgtagcatat gttttagata agtgtgatgt tgcactctta taagaatcgg cttccgattt
 1800
 ccatgttggt ttataaattg ttcgattgcc atcaatacca tttttaataa ggtcagagta
 1860
 40 atcttttagt gattctttcg tgcttgata ttttcggaat ccagcattaa tactatacaa
 1920
 ttgattacca tcagcttcta atgtgttaaa aggaacagaa ttcccttcaa aagcaccttt
 1980
 gataccgaat aaattatggg ttgggtgactt agctaaagca ctacgacctg agtcagattc
 2040
 45 taagattgct tgggcaatca tgacagacgc ataaatatcg ttatcttgac caatgcgatg
 2100
 tgcactctta gcaattgatt tgacaaattg acgtgtatct tttgagtcaa caacgttaaa
 2160
 50 ttgtccgcta tcatcattgt tagatatact aggatctgtt tcgaataatg atgttgcacg
 2220
 tgtatccttt tgattaacat cgttattgaa tgattgagca ggtttagatt tatgtttcaa
 2280
 ttcactctgt gttggtaact gtggattctt tgtattagat ttttcatttt tgtctttttt
 2340
 55 agattgagat gcataatctt tttgtgtttt ctttgcactt tcaactgtatt gatc
 2394

60 <210> 7
 <211> 2033
 <212> DNA
 <213> Staphylococcus aureus


```

<400> 7
gatctggaac aggtttcatt gtcggtaaaa atacaattgt taccaacaag catgtcgttg 60
caggtatgga aattgggtgca catattatag cgcaccccaa tgggtgaatat aataatggcg
120
5 gattttataa agttaaaaaa attgtccggt attcagggtca agaagatatt gccattctac
180
atgtggaaga taaagctggt catccaaaaa acaggaattt taaagattac acaggcattt
240
10 taaaaatagc atcagaagct aaagaaaatg aacgcatttc aattggtggc tatccagaac
300
catatataaa taaatttcaa atgtatgagt caacaggaaa agtgctgtca gttaaaggca
360
acatgattat tactgatgct ttcgtagaac caggcaactc aggttcagct gtatttaaca
420
15 gtaaatacga agttgtaggt gttcactttg gtggaaacgg ccctggaaat aaaagtacaa
480
aaggatatgg tgtttatttc tctcctgaaa ttaagaaatt cattgcagat aacacagata
540
20 aataaatcct tacatagata aatgatttta aaaattaaca acaaactcaa caattcaa
600
catctctgtg attccattta ttcgaaatga ttaaaaaaaa taaaacttca aaaagcta
660
attataatta tacaataact tagaggagca gaaaaatgaa taaaaatata atcatcaaaa
720
25 gtattgcagc attgacgatt ttaacatcaa taactggtgt cggcacaaca atggttgaag
780
gtattcaaca aacagccaaa gccgaaaata ctgttaaaca aattacaaat acaaatgttg
840
30 caccatacag tgggtgttaca tggatgggag ctggaacagg atttgtagtt ggaaatcata
900
caatcattac caataaacat gttacctatc acatgaaagt cggatgatgaa atcaaagcac
960
atcctaattg tttttataat aacggtggtg gactttataa agttactaag attgtagatt
1020
35 atcctggtta agaagatatt gcggtgtgtc aagttgaaga aaaatcaaca caacaaaag
1080
gtagaaaatt caaagatttc actagtaa ataatatagc atcagaagct aaagaaaatg
1140
40 aacctatata agtcattggt tatccaaatc ctaatggaaa taaactacaa atgtatgaat
1200
caactggtaa agtattatca gtgaatggga atatagtgtc ttcggatgca attattcagc
1260
ctggtagctc tggttcacct atattaaata gtaaacacga agctattggt gtaatctatg
1320
45 ccggtataaa gccatcaggt gaaagcaca gaggatttgc tgtttatttc tctcctgaaa
1380
ttaagaaatt cattgcagat aatttagata aataattaaa acttagacat tcaccaatc
1440
ctgacaaaat atactataac taacatttat taatatatat tgcattattt aatatgcatc
1500
50 aaagccaatc aacgattgat tttcaccaac tcaattgttg attggtttta tttatgtatg
1560
aatgaacaac tttttgacat cattaagaat ataatgatt ttgaaagcat ttgaaagcta
1620
55 caacatttct ataaaatttt tcaataacaa ttgcgccact aaaactcaaa atttcacca
1680
ccaacatcca aattatcaac atcgcaacat aaccaaattg tataataaat ctattacaca
1740
aagagataaa ttacttatgc aaaggcggag gaatcacatg tctattactg aaaaacaacg
1800
60 tcagcaacaa gctgaattac ataaaaaatt atgggtcgatt gcgaatgatt taagagggaa
1860

```


catggatgcg agtgaattcc gtaattacat tttaggcttg attttctatc gcttcttatac
 1920
 tgaaaaagcc gaacaagaat atgcagatgc cttgtcaggt gaagacatca cgtatcaaga
 1980
 5 agcatgggca gatgaagaat atcgtgaaga cttaaaagca gaattaattg atc
 2033

<210> 8
 10 <211> 2794
 <212> DNA
 <213> Staphylococcus aureus

<400> 8
 15 gatcaaacgt tgcttaactt ctttttaatg cttaaaaatt atttcaaagg cacatagaaa 60
 cgctatatta atctcatact cactcattat tttttgctta aattacttaa taatacttca
 120
 ataattgtta aaaggggttt aatgtgatta tcttagaacg ccatctataa tgatgttgta
 180
 20 tgattcaaat tacgtaaaaa gacaatcgaa tataatatag attggagcat acaattatga
 240
 aaatgagaac aattgctaaa accagtttag cactagggct ttaacaaca ggcgcaatta
 300
 25 cagtaacgac gcaatcggtc aaagcagaaa aaatacaatc aactaaagtt gacaaagtac
 360
 caacgcttaa agcagagcga ttagcaatga taaacataac agcaggtgca aattcagcga
 420
 caacacaagc agctaacaca agacaagaac gcacgcctaa actcgaaaag gcaccaaata
 480
 30 ctaatgagga aaaaacctca gcttccaaaa tagaaaaaat atcacaacct aaacaagaag
 540
 agcagaaaac gcttaatatata tcagcaacgc cagcgcctaa acaagaacaa tcacaaacga
 600
 35 caaccgaatc cacaacgccg aaaactaaag tgacaacacc tccatcaaca aacacgccac
 660
 aaccaatgca atctactaaa tcagacacac cacaatctcc aaccataaaa caagcacaaa
 720
 cagatatgac tcctaaatat gaagatttaa gagcgtatta tacaaaaccg agttttgaat
 780
 40 ttgaaaagca gtttggaattt atgctcaaac catggacgac ggtagggttt atgaatgtta
 840
 ttccaaatag gttcatctat aaaatagctt tagttggaaa agatgagaaa aaatataaag
 900
 45 atggacctta cgataatatc gatgtattta tcgtttttaga agacaataaa tatcaattga
 960
 aaaaatatte tgtcggtggc atcacgaaga ctaatagtaa aaaagttaat cacaaagtag
 1020
 aattaagcat tactaaaaaa gataatcaag gtatgatttc acgcgatgtt tcagaataca
 1080
 50 tgattactaa ggaagagatt tccttgaaag agcttgattt taaattgaga aaacaactta
 1140
 ttgaaaaaca taatctttac ggtaacatgg gttcaggaac aatcgttatt aaaatgaaaa
 1200
 55 acggtgggaa atatacgttt gaattacaca aaaaactgca agagcatcgt atggcagacg
 1260
 tcatagatgg cactaatatt gataacattg aagtgaatat aaaataatca tgacattctc
 1320
 taaatagaag ctgtcatcgg aaaaacaaga agttaagtga caacggttta catgttgctt
 1380
 60 agcttctttt attatgcgta atgatgtaaa aagacgaata ttcatttggt tgtaaaagtg
 1440
 gcatttctat gtcttaaaag tgacgaaact tcaaagtgtc caagtgttga atcacatcaa
 1500

aatcattttt atttaacgaa cattatggat ttcttaattt acttaacgat gattcaaata
 1560
 tagttaaaca aggtttaatg tgaatggagc aatacgccat ctataataaa gctgtatgat
 1620
 5 tcaatgaatg taatcgaaca aatctaataa ttacgaatgg agcatacaac tatgaaaata
 1680
 acaacgattg ctaaaacaag tttagcacta ggccttttaa caacaggtgt aatcacaacg
 1740
 10 acaacgcaag cagcaaacgc gacaacacta tcttccacta aagtggaagc accacaatca
 1800
 acaccgccct caactaaaat agaagcaccg caatcaaaac caaacgcgac aacaccgccc
 1860
 tcaactaaag tagaagcacc gcaacaaaca gcaaatgcga caacaccgcc ttcaactaaa
 1920
 15 gtgacaacac ctccatcaac aaacacgccca caaccaatgc aatctactaa atcagacaca
 1980
 ccacaatcgc caaccacaaa acaagtacca acagaaataa atcctaaatt taaagattta
 2040
 20 agagcgtatt atacgaaacc aagtttagaa tttaaaaatg agattggtat tatttttaaaa
 2100
 aaatggacga caataagatt tatgaatggt gtcccagatt atttcatata taaaattgct
 2160
 ttagttggta aagatgataa aaaatatggt gaaggagtac ataggaatgt cgatgtattt
 2220
 25 gtcgttttag aagaaaataa ttacaatctg gaaaaatatt ctgtcgggtg tatcacaag
 2280
 agtaatagta aaaaagttga tcacaaagca ggagtaagaa ttactaagga agataataaa
 2340
 30 ggtacaatct ctcatgatgt ttcagaattc aagattacta aagaacagat ttccttgaaa
 2400
 gaacttgatt ttaaattgag aaaacaactt attgaaaaaa ataatctgta cggtaacggt
 2460
 ggttcaggta aaattggtat taaaatgaaa aacggtggaa agtacacggt tgaattgcac
 2520
 35 aaaaaattac aagaaaatcg catggcagat gtcatagatg gcactaatat tgataacatt
 2580
 gaagtgaata taaaataatc atgacattct ctaaatagaa gctgtcatcg gaaaaacaag
 2640
 40 aagttaagtg acaacggcct acatgttgct tagcttcttt tgttatgttc gatgatttga
 2700
 gaacccgaat tttcgtatggg tccaaatatg acgtggaaga gacctgaatt tatctgtaaa
 2760
 tccctatcta tcgggtgtga agcacaacgg gatc
 2794
 45
 <210> 9
 <211> 505
 <212> DNA
 50 <213> Staphylococcus aureus
 <400> 9
 gatcatagcg caccaaactc tcgtccaatt gatthttgaaa tgaaaaagaa agatggaact 60
 caacagtttt atcattatgc aagttctgtt aaacctgcta gagttatttt cactgattca
 120
 55 aaaccagaaa ttgaattagg attacaatca ggtcaatttt ggagaaaatt tgaagtttat
 180
 gaaggtgaca aaaagttgcc aattaaatta gtatcatacg atactgttaa agattatgct
 240
 60 tacattcgct tctctgtatc aaacggaaca aaagctgtta aaattgtag ttcaacacac
 300
 ttcaataaca aagaagaaaa atacgattac acattaatgg aattcgacac accaatttat
 360

aacagtgcag ataaattcaa aactgaagaa gattataaag ctgaaaaatt attagcgcca
 420
 tataaaaaag cgaaaacact agaaagacaa gtttatgaat taaataaaat tcaagataaa
 480
 5 cttcctgaaa aattaaaggc tgagt
 505

<210> 10
 10 <211> 673
 <212> DNA
 <213> Staphylococcus aureus

<400> 10
 15 gatcaaacta aaacacaaac tgctcataca gttaaaacag cacaaactgc tcaagaacaa 60
 aataaagttc aaacacctgt taaagatggt gcaacagcga aatctgaaag caacaatcaa
 120
 gctgtaagtg ataataaatc acaacaaact aacaaagtta caaaacataa cgaaacgcct
 180
 20 aaacaagcat ctaaagctaa agaattacca aaaactgggt taacttcagt tgataacttt
 240
 attagcacag ttgccttcgc aacacttgcc ctttttaggtt cattatcttt attacttttc
 300
 aaaagaaaag aatctaaata aatcatcgtc acactcataa cttaatatat tttttatttt
 25 360
 aaattttatt taacctatgt catagatatt tcataatcta taacataggt tatttttttt
 420
 ataaaataac gttgcaatta actaacattt caatgtcaat acaagtaatc aattgataat
 480
 30 gattatcagt tgataatata caattaggag ttgtttctac aacatgaaca aacagcaaaa
 540
 agaatttaaa tcattttatt caattagaaa gtcactacta ggcgtgcac tgtagcaatt
 600
 agtacacttt tattattaat gtcaaattggc gaagcacaag ccagcagctt gaagaaaaca
 35 660
 ggtggtccaa ttc
 673

<210> 11
 40 <211> 2238
 <212> DNA
 <213> Staphylococcus aureus

<400> 11
 45 gatcttcagc ttgatgtttt cgtttgatta aattggtaaa atagaaacgc aatccacaaa 60
 aatggcaagc actaaaataa tgtttggggg tgcttggtgt tttgtggatt gcggtcgatt
 120
 atttatattg catgatttga ttaatttgat tgattatatt ggacatgatg gtggtggcgg
 50 180
 gatgcgttgt tgctagtcgc gggctttgtc cactccacat atgtattaac tctttgtcgc
 240
 cgatgtttgc tgcggctttt cttatgctac ttgttagctc attttgtatt ggataatctg
 300
 55 ggatatcgcc ttcgtattgg gacatttctt cgataaacct attgttgata ccgctgcaa
 360
 gctttccact aaacgctttt gtaatgactg tatctgtttc tttactatit ataattgcat
 420
 ctcgcagtag ttctgatgca ttaactgtct gtgatgttaa aaatgcggtg cccatttgta
 60 480
 ccccttctgc acctaaagaca atacttgcca aaactcctct accatccata attccaccag
 540

cggcaatgac cggaattgaa acgacatcta caatttgtgg cactaaagat attgttccaa
 600
 ccataggtaa ttgattttta ggtttttaaaa atgaaccacg atgtccacct gcttcactac
 660
 5 cttgagcaac gatagcatcc ataccgctt tttcattcgc aatagcttca tcaacacttg
 720
 ttgctgtacc tataagtttg acattcgttg ctttcaacct gcttataatc tgttcgcttg
 780
 10 gaattccaaa agtaaaacaa catacaggca cttgcttttt aattatcgta tcaatatgac
 840
 acttaaattg ttgttcttcg gtaattttta caaccggctc ttctaaatgt aatgcgcgctc
 900
 gataagggtt taaccatgca ttcataatctt caatttgact actggtatat gattgttgac
 960
 15 ttggtacaaa gacatttacg ccaaaagaat ttgacgttaa ttggcgtaca taatctatct
 1020
 catcttccaa ttgctgcgta ttaaagtaac ctgcgcctat tgtgcctaac ccaccactgt
 1080
 tacttactga tgcaactaat ttcggtgtcg tacttcctgc catacctgct tgtataattg
 1140
 20 gatattcaat acttaacatt tgagtaagtc gattcttatt ccacatagct gttcgcctcct
 1200
 tatatagata cgttgcgatt tttccggttg tgaaattgaa tttgctgttg agaaagtctt
 1260
 25 tctttttcct ttttatccat ctcatcttca atttccatac ctaataattc ttcaattaag
 1320
 tcttcatgtg aactatcgc ttcagtacca ccaaatcgt ccaacacaat tgctaaatgt
 1380
 30 tttctagaaa tagtcatctt acgtaatacc cattcagctt tattgtgttc attcacaat
 1440
 aatggcttag ctgaatagtt tgtaatttga ttttcttttt tattactcca agccaacaga
 1500
 tatttagaat gaaacacccc aataatgtta tcaatatctc cctcgtaacac tggatatcta
 1560
 35 gtgtatggct tattcataac cgtttcataa acttcttcgt atgtcgcat tgaagcaa
 1620
 gccgtcacat taattctagg tgttgtatct acatctttta cttttaaatt ttcaaaatta
 1680
 40 atgacacctt ccaacctact cgtctcaatt tcatttaaag caccttcatg tccagcaatt
 1740
 gctaacattg ttttaaattc ttcttttgaa aattgatgtt cttgaggttg gcccttagat
 1800
 aaacttcgat taatactgtc cgtcaactta tttaaaagta atgtgatagg acggaacaca
 1860
 45 atgacacaaa tattaataat tggatataca agccttgta ttttatctgg aaatgttgca
 1920
 gcgacagact tgggaatcac ttcggagatc aaaatgataa caactgttaa aacagctgat
 1980
 50 gcaataccaa cgctaattcc ccaacgtaaa gccataattg taacaagtgt tggtaataaa
 2040
 atattcgcga cattattccc aattagaatc gttgtaataa actcacttgg tttttcaagt
 2100
 aactttacaa tgccttttgc ttttttatca cctttgtcag cttcagtttt aaattttgct
 2160
 55 ttattggcag ccgttaatgc cgtctcgctt cctgaaaaga aaaacgaaat aaatatcaat
 2220
 ataattatgg caatgatc
 2238
 60
 <210> 12
 <211> 7975
 <212> DNA

<213> *Staphylococcus aureus*

<400> 12

5 gatcaaacga caattattaa ttogttaacg tttactgaaa cagtaccaa tagaagttat 60
 gcaagagcaa gtgcgaatga aatcactagt aaaacagtta gtaatgtcag tegtactgga
 120
 aataatgcca atgtcacagt aactgttact tatcaagatg gaacaacatc aacagtgact
 180
 10 gtacctgtaa agcatgtcat tccagaaatc gttgcacatt cgcattacac tgtacaaggc
 240
 caagacttcc cagcaggtaa tgggttctagt gcatcagatt actttaagtt atctaattggt
 300
 agtgacattg cagatgcaac tattacatgg gtaagtggac aagcgccaaa taaagataat
 360
 15 acacgtattg gtgaagatat aactgtaact gcacatatct taattgatgg cgaaacaacg
 420
 ccgattacga aaacagcaac atataaagta gtaagaactg taccgaaaca tgtctttgaa
 480
 acagccagag gtgttttata cccaggtggt tcagatatgt atgatgcgaa acaatatggt
 540
 20 aagccagtaa ataattcttg gtgcacaaat gcgcaacata tgaatttcca atttgttgga
 600
 acatatgggc ctaacaaaga tgttgtaggc atatctactc gtcttattag agtgacatat
 660
 25 gataatagac aaacagaaga tttaactatt ttatctaaag ttaaacctga cccacctaga
 720
 attgacgcaa actctgtgac atataaagca ggtcttacia accaagaaat taaagttaat
 780
 aacgtattaa ataactcgtc agtaaaatta tttaaagcag ataatacacc attaaatgtc
 840
 30 acaaataatta ctcatggtag cggtttttagt tccggttgta cagtaagtga cgcgttacca
 900
 aatggcggaa ttaaagcaaa atcttcaatt tcaatgaaca atgtgacgta tacgacgcaa
 960
 35 gacgaacatg gtcaagttgt tacagtaaca agaaatgaat ctgttgattc aaatgacagt
 1020
 gcaacagtaa cagtgcacc acaattacia gcaactactg aaggcgctgt atttattaaa
 1080
 40 ggtggcgacg gttttgattt cggacacgta gaaagattta ttcaaaaccc gccacatggg
 1140
 gcaacggttg catggcatga tagtccagat acatggaaga atacagtcgg taacactcat
 1200
 aaaactgcgg ttgtaacatt acctaatggt caaggtacgc gtaatgttga agttccagtc
 1260
 45 aaagtttatc cagttgctaa tgcaaaggcg ccatcacgtg atgtgaaagg tcaaaatttg
 1320
 actaatggaa cggatgcgat gaactacatt acatttgatc caaatacaaa cacaaatggt
 1380
 atcactgcag catgggcaaa tagacaacia ccaaataacc aacaagcagg cgtgcaacat
 1440
 50 ttaaatgtcg atgtcacata tccaggtatt tcagctgcta aacgagttcc tgttactgtt
 1500
 aatgtatatc aatttgaatt ccctcaaact acttatacga caacggttgg aggcacttta
 1560
 55 gcaagtggta cgcaagcatc aggatatgca catatgcaaa atgctactgg ttaccaaca
 1620
 gatggattta cgtataaatg gaatcgtgat actacaggta caaatgacgc aaactgggtca
 1680
 60 gctatgaata aaccgaatgt ggctaaagtc gttaacgcaa aatatgacgt catctataac
 1740
 ggacatactt ttgcaacatc ttaccagcg aaatttgtag taaaagatgt gcaaccagcg
 1800

aaaccaactg tgactgaaac agcggcagga gcgattacaa ttgcacctgg agcaaacc
 1860
 acagtgaata cacatgccgg taacgtaacg acatacgctg ataaattagt tattaacgt
 1920
 5 aatggtaacg ttgtgacgac atttacacgt cgcaataata cgagtccatg ggtgaaagaa
 1980
 gcatctgcag caactgtagc aggtattgct ggaactaata atggtattac tgttgcagca
 2040
 10 ggtactttca accctgctga tacaattcaa gttgttgcaa cgcaaggaag cggagagaca
 2100
 gtgagtgatg agcaacgtag tgatgatttc acagttgtcg caccacaacc gaaccaagcg
 2160
 actactaaga tttggcaaaa tggtcattat gatatcacgc ctaataatcc atcaggacat
 2220
 15 ttaattaatc caactcaagc aatggatatt gcttactctg aaaaagtggg taatggtgca
 2280
 gaacatagta agacaattaa tgttgttcgt ggtcaaaata atcaatggac aattgcgaat
 2340
 20 aagcctgact atgtaacgtt agatgcacaa actggtaaag tgacgttcaa tgccaatact
 2400
 ataaaaccac attcatcaat cacaattact ccgaaagcag gtacaggtca ctcagtaagt
 2460
 agtaatccaa gtacattaac tgcaccggca gctcactctg tcaacacaac tgaaattgtg
 2520
 25 aaagattatg gttcaaagt aacagcagct gaaattaaca atgcagttca agttgcta
 2580
 aaacgtactg caacgattaa aaatggcaca gcaatgccta ctaatttagc tgggtgtagc
 2640
 30 acaacgacga ttcctgtgac agtaacttac aatgatggta gtactgaaga agtacaagag
 2700
 tccattttca caaaagcggg taaacgtgag ttaatcacag ctaaaaatca tttagatgat
 2760
 ccagtaagca ctgaaggtaa aaagccaggt acaattacgc agtacaataa tgcaatgcat
 2820
 35 aatgcgcaac aacaaatcaa tactgcgaaa acagaagcac aacaagtgat taataatgag
 2880
 cgtgcaacac cacaacaagt ttctgacgca ctaactaaag ttcgtgcagc acaaactaag
 2940
 attgatcaag ctaaagcatt acttcaaaat aaagaagata atagccaatt agtaacgtct
 3000
 40 aaaaataact tacaagttc tgtgaaccaa gtaccatcaa ctgctgggtat gacgcaacaa
 3060
 agtattgata actataatgc gaagaagcgt gaagcagaaa ctgaaataac tgcagctcaa
 3120
 45 cgtgttattg acaatggcga tgcaactgca caacaaattt cagatgaaaa acatcgtgtc
 3180
 gataacgcat taacagcatt aaaccaagcg aaacatgatt taactgcaga tacacatgcc
 3240
 50 ttagagcaag cagtgaaca attgaatcgc acaggtacaa cgactggtaa gaagccggca
 3300
 agtattactg cttacaataa ttogattcgt gcacttcaaa gtgacttaac aagtgctaaa
 3360
 aatagcgcta atgctattat tcaaaagcca ataagaacag tacaagaagt gcaatctgcg
 3420
 55 ttaacaaatg taaatcgtgt caatgagcga ttaacgcaag caattaatca attagtacct
 3480
 ttagctgata atagtgtttt aaaaactgct aagacgaaac ttgatgaaga aatcaataaa
 3540
 60 tcagtaacta ctgatgggtat gacacaatca tcaatccaag catatgaaaa tgctaaacgt
 3600
 gcgggtcaaa cagaatcaac aaatgcacaa aatgttatta acaatgggtga tgcgactgac
 3660

caacaaattg ccgcagaaaa aacaaaagta gaagaaaaat ataatagctt aaaacaagca
 3720
 attgctggat taactccaga cttggcacca ttacaaactg caaaaactca gttgcaaaat
 3780
 5 gatattgatc agccaacgag tacgactggg atgacaagcg catctattgc agcattttaat
 3840
 gaaaaacttt cagcagctag aactaaaatt caagaaattg atcgtgtatt agcctcacat
 3900
 10 ccagatggtg cgacaatacg tcaaaacgtg acagcagcga atgccgctaa atcagcactt
 3960
 gatcaagcac gtaatggctt aacagtcgat aaagcgctt tagaaaatgc gaaaaatcaa
 4020
 ctacaatata gtattgacac gcaaacaagt acaactggta tgacacaaga ctctataaat
 4080
 15 gcatacaatg cgaagttaac agctgcacgt aataagattc aacaaatcaa tcaagtatta
 4140
 gcaggttcac cgactgtaga acaaattaat acaaatacgt ctacagcaaa tcaagctaaa
 4200
 20 tctgatttag atcatgcacg tcaagcttta acaccagata aagcgccgct tcaaactgcg
 4260
 aaaacgcaat tagaacaag cattaatcaa ccaacggata caacaggtat gacgaccgct
 4320
 tcgttaaattg cgtacaacca aaaattacaa gcagcgcgctc aaaagttaac tgaaattaat
 4380
 25 caagtgttga atggcaaccc aactgtccaa aatatcaatg ataaagtgc agaggcaaac
 4440
 caagctaagg atcaattaaa tacagcacgt caaggtttaa cattagatag acagccagcg
 4500
 30 ttaacaacat tacatggtgc atctaactta aaccaagcac aacaaaataa tttcacgcaa
 4560
 caaattaatg ctgctcaaaa tcatgctgcg cttgaaacaa ttaagtctaa cattacggct
 4620
 ttaaatactg cgatgacgaa attaaaagac agtggtgcgg ataataatac aattaaatca
 4680
 35 gatcaaaatt acactgacgc aacaccagct aataaacaag cgtatgataa tgcagttaat
 4740
 gcggtctaaag gtgtcattgg agaaacgact aatccaacga tggatgttaa cacagtgaac
 4800
 40 caaaaagcag catctgttaa atcgacgaaa gatgcttttag atgggtcaaca aaacttacia
 4860
 cgtgcgaaaa cagaagcaac aaatgcgatt acgcatgcaa gtgattttaa ccaagcacia
 4920
 aagaatgcat taacacaaca agtgaatagt gcacaaaacg tgcaagcagt aaatgatatt
 4980
 45 aaacaaacga ctcaaagctt aaatactgct atgacagggt taaaacgtgg cgttgcta
 5040
 cataaccaag tcgtacaaag tgataattat gtcaacgcag atactaataa gaaaaatgat
 5100
 50 tacaacaatg catacaacca tgcgaatgac attattaatg gtaatgcaca acatccagtt
 5160
 ataacaccaa gtgatgttaa caatgcttta tcaaagtca caagtaaaga acatgcattg
 5220
 aatgggtgaag ctaagttaaa tgctgcgaaa caagaagcga atactgcatt aggtcattta
 5280
 55 aacaatttaa ataatgcaca acgtcaaaac ttacaatcgc aaattaatgg tgcgcatcaa
 5340
 attgatgcag ttaatacaat taagcaaaat gcaacaaact tgaatagtgc aatgggtaac
 5400
 60 ttaagacaag ctggtgcaga taaagatcaa gtgaaacgta cagaagatta tgcggatgca
 5460
 gatacagcta aacaaaatgc atataacagt gcagtttcaa gtgccgaaac aatcattaat
 5520

caaacaacaa atccaacgat gtctgttgat gatgttaate gtgcaacttc agctgttact
 5580
 tctaataaaa atgcattaaa tggttatgaa aaattagcac aatctaaaac agatgctgca
 5640
 5 agagcaattg atgcattacc acattttaa atgcacaaa aagcagatgt taaatctaaa
 5700
 attaattgctg catcaaataat tgctggcgta aatactgtta aacaacaagg tacagattta
 5760
 10 aatacagcga tgggtaactt gcaaggtgca atcaatgatg aacaaacgac gcttaatagt
 5820
 caaaactatc aagatgcgac acctagtaag aaaacagcat acacaaatgc ggtacaagct
 5880
 gcgaaagata ttttaaataa atcaaattgg taaaataaaa cgaaagatca agttactgaa
 5940
 15 gcgatgaatc aagtgaattc tgctaaaaat aacttagatg gtacgcgttt attagatcaa
 6000
 gcgaagcaaa cagcaaaaaca gcagttaaat aatatgacgc atttaacaac tgcacaaaaa
 6060
 20 acgaatttaa caaaccaaat taatagtggc actactgtcg ctgggtgttca aacgggtcaa
 6120
 tcaaattgcca atacattaga tcaagccatg aatacgttaa gacaaagtat tgccaacaaa
 6180
 gatgcgacta aagcaagtga agattacgta gatgctaata atgataagca aacagcatat
 6240
 25 aacaacgcag tagctgctgc tgaaacgatt attaatgcta atagtaatcc agaaatgaat
 6300
 ccaagtacga ttacacaaaa agcagagcaa gtgaatagtt ctaaaacggc acttaacggc
 6360
 30 gatgaaaact tagctgctgc aaaacaaaat gcgaaaacgt acttaaacac attgacaagt
 6420
 attacagatg ctcaaaagaa caatttgatt agtcaaatta ctagtgcgac aagagtgagt
 6480
 ggtgttgata ctgtaaaaca aaatgcgcaa catctagacc aagctatggc tagcttacag
 6540
 35 aatgggtatta acaacgaatc tcaagtgaat tcatctgaga aatatcgtga tgctgataca
 6600
 aataaacaac aagagtatga taatgctatt actgcagcga aagcgatttt aaataaatcg
 6660
 40 acaggtccaa aactgcgca aaatgcagtt gaagcagcat tacaacgtgt taataatgcg
 6720
 aaagatgcat tgaatggtga tgcaaaatta attgcagctc aaaacgcagc gaaacaacat
 6780
 ttaggtactt taacgcatat cactacagct caacgtaatg atttaacaaa tcaaatttca
 6840
 45 caagctacaa acttagctgg tgttgaatct gttaaacaaa atgcgaatag tttagatggc
 6900
 gctatgggta acttacaac ggctatcaac gataagtcag gaacattagc gagccaaaac
 6960
 50 ttcttgatg ctgatgagca aaaacgtaat gcatacaatc aagctgtatc agcagccgaa
 7020
 accatthttaa ataaacaaac tggaccgaat acagcgaaaa cagcagtcga acaagcactt
 7080
 aataatgtta ataatgcgaa acatgcatta aatggtagc aaaacttaaa caatgcgaaa
 7140
 55 caagcagcga ttacagcaat caatggcgca tctgatttaa atcaaaaaca aaaagatgca
 7200
 ttaaaagcac aagctaattg tgctcaacgc gtatctaatt cacaagatgt acagcacaat
 7260
 60 gcgactgaac tgaacacggc aatgggcaca ttaaaacatg ccatcgcaga taagacgaat
 7320
 acgttagcaa gcagtaaata tgttaatgcc gatagcacta aacaaaatgc ttacacaact
 7380

aaagttacca atgctgaaca tattattagc ggtacgcca cggttgttac gacaccttca
 7440
 gaagtaacag ctgcagctaa tcaagtaa acgcgcgaac aagaattaaa tggtagcgaa
 7500
 5 agattacgtg aagcaaaaca aaacgccaat actgctattg atgcattaac acaattaaat
 7560
 acacctcaaa aagctaaatt aaaagaacaa gtgggacaag ccaatagatt agaagacgta
 7620
 10 caaactgttc aaacaaatgg acaagcattg aacaatgcaa tgaaaggctt aagagatagt
 7680
 attgctaacg aaacaacagt caaaacaagt caaaactata cagacgcaag tccgaataac
 7740
 caatcaacat ataatagcgc tgtgtcaa atgcgaaaggta tcattaatca aactaacaat
 7800
 15 ccgactatgg atactagtgc gattacccaa gctacaacac aagtgaataa tgctaaaaat
 7860
 ggtttaaacg gtgctgaaaa cttaagaaat gcacaaaaca ctgctaagca aaacttaa at
 7920
 20 acattatcac acttaacaaa taaccaaaaa tctgccatct catcacaat tgatc
 7975

 <210> 13
 <211> 2001
 25 <212> DNA
 <213> Staphylococcus aureus

 <400> 13
 30 gatcatggca ttgtatttaa tgcaagtcta cctttgtaca aagatgccat ccatcaaaaa 60
 ggatcaatgc gcagtaatga caatggatgat gatatgagta tgatgggtggg tacagtgtctg
 120
 agtggctttg aatatcgagc gcaaaaagaa aagtatgata acttatataa attcttcaaa
 180
 35 gaaaatgaaa agaaatatca atatacaggc tttaaaaaag aggcaattaa caagacacaa
 240
 aatgtcggat ataaaaatga atatttttat attacatact cttctagaag tttaaaagaa
 300
 tatcgaaagt attatgaacc actgattcga aaaaatgata aagaatttaa agaaggaatg
 360
 40 gaacgagcaa gaaaagaagt gaattacgct gcaaatacag atgctgttgc tacacttttt
 420
 tctactaaga aaaactttac taaagacaat acagtagatg atgtaatcga actaagtgat
 480
 45 aaattatata atttaaaaaa taaaccagat aaatctacaa tcacaatata aatagggaaa
 540
 cccactatta atactaagaa agccttttat gatgataatc gtccaataga atatgggggtg
 600
 cacagtaaag atgaataaaa ttaatgatag ggatttaaca gaattaagta gttactgggt
 660
 50 ttatcaaat attgatataa aaaaagaatt taaagttaat ggaaaaagggt ttaacaagt
 720
 agacagttat aatgatgata agaatagtaa tttgaatggg gctgctgata ttaaaatata
 780
 55 tgagttatta gatgataaaa gtaaaccaac tgggtcaacag acaataattt atcaaggaac
 840
 atctaataag gcaattaatc caaataatcc attaaaatca tcgggggtttg gagatgattg
 900
 gctccaaaat gctaaattaa tgaataatga taatgaaagc acagattatt taaagcaaac
 960
 60 agatcaatta tcaaatcaat ataaaataaa gttagaagat gcagatagat tatcaaatag
 1020
 tgatttttta aaaaaatata gaatggaatc aagtaacttc aaaaacaaaa ccattgtggc
 1080

ggatggcggg aattcggaag gcgggtgcagg agcaaaatat caaggagcga aacatccgaa
 1140
 tgaaaaagtt gttgctactg actcagcaat gattccttat gctgcttggc agaaatttgc
 1200
 5 tagaccacgc tttgataata tgattagttt taatagtacc aacgatttat taacatgggt
 1260
 acaagatcca ttcatacaag atatgccagg aaaacgcgtt aacattaatg atgggtgtgcc
 1320
 10 caggtttagat actttaatag acagccatgt aggttataaa aggaagttaa atagaaaaga
 1380
 taacacatac gatactgtac cactaatcaa aataaagtcg gtaaaagata cagaaattaa
 1440
 aaatggaaaa aaagtaaaaa agactattaa cataacatta gatatggatg ggcgaattcc
 1500
 15 aataaatggt tggacaggag attcgattgc acgttctgga agaggaactt taattaaact
 1560
 taatttagaa aatcttgatg cgttgagtaa actgattact ggtgaaacaa gtggtatggt
 1620
 agcagaatgc gtaatctttt taaatgaaag ttttaacatc tcagaaaatg aaaataaaaa
 1680
 20 ttttgcagat agaaagaaac aattatcaga aggatttaag gataagatta acttatttca
 1740
 gttagaagaa atggaaagaa ctttaattag taaaataaac tcacttgaag aagttgcaga
 1800
 25 tgaaacaata gaaagtatta gtgctgttaa acacttatta cctgattttg cattggatgc
 1860
 attaaaagaa agaattaatg agttgtttta aggtataaaa tcttttatag aaaaagtgt
 1920
 tgatagtata gataatgaaa ttttagaaat tttcaaaaat atagatcacg acttcagaga
 1980
 30 tggagtatct gaagaaatga t
 2001

35 <210> 14
 <211> 106
 <212> PRT
 <213> Staphylococcus aureus

40 <400> 14
 Asp Gln Thr Lys Thr Gln Thr Ala His Thr Val Lys Thr Ala Gln Thr
 1 5 10 15
 45 Ala Gln Glu Gln Asn Lys Val Gln Thr Pro Val Lys Asp Val Ala Thr
 20 25 30
 Ala Lys Ser Glu Ser Asn Asn Gln Ala Val Ser Asp Asn Lys Ser Gln
 35 40 45
 50 Gln Thr Asn Lys Val Thr Lys His Asn Glu Thr Pro Lys Gln Ala Ser
 50 55 60
 Lys Ala Lys Glu Leu Pro Lys Thr Gly Leu Thr Ser Val Asp Asn Phe
 65 70 75 80
 55 Ile Ser Thr Val Ala Phe Ala Thr Leu Ala Leu Leu Gly Ser Leu Ser
 85 90 95
 60 Leu Leu Leu Phe Lys Arg Lys Glu Ser Lys
 100 105

<210> 15

<211> 960
 <212> PRT
 <213> Staphylococcus aureus

5 <400> 15
 Asp Arg Ile Ile Glu Thr Ala Pro Thr Asp Tyr Leu Ser Trp Gly Val
 1 5 10 15

10 Gly Ala Val Gly Asn Pro Arg Phe Ile Asn Val Glu Ile Val His Thr
 20 25 30

His Asp Tyr Ala Ser Phe Ala Arg Ser Met Asn Asn Tyr Ala Asp Tyr
 35 40 45

15 Ala Ala Thr Gln Leu Gln Tyr Tyr Gly Leu Lys Pro Asp Ser Ala Glu
 50 55 60

Tyr Asp Gly Asn Gly Thr Val Trp Thr His Tyr Ala Val Ser Lys Tyr
 65 70 75 80

20 Leu Gly Gly Thr Asp His Ala Asp Pro His Gly Tyr Leu Arg Ser His
 85 90 95

25 Asn Tyr Ser Tyr Asp Gln Leu Tyr Asp Leu Ile Asn Glu Lys Tyr Leu
 100 105 110

Ile Lys Met Gly Lys Val Ala Pro Trp Gly Thr Gln Ser Thr Thr Thr
 115 120 125

30 Pro Thr Thr Pro Ser Lys Pro Thr Thr Pro Ser Lys Pro Ser Thr Gly
 130 135 140

Lys Leu Thr Val Ala Ala Asn Asn Gly Val Ala Gln Ile Lys Pro Thr
 145 150 155 160

35 Asn Ser Gly Leu Tyr Thr Thr Val Tyr Asp Lys Thr Gly Lys Ala Thr
 165 170 175

40 Asn Glu Val Gln Lys Thr Phe Ala Val Ser Lys Thr Ala Thr Leu Gly
 180 185 190

Asn Gln Lys Phe Tyr Leu Val Gln Asp Tyr Asn Ser Gly Asn Lys Phe
 195 200 205

45 Gly Trp Val Lys Glu Gly Asp Val Val Tyr Asn Thr Ala Lys Ser Pro
 210 215 220

Val Asn Val Asn Gln Ser Tyr Ser Ile Lys Pro Gly Thr Lys Leu Tyr
 225 230 235 240

50 Thr Val Pro Trp Gly Thr Ser Lys Gln Val Ala Gly Ser Val Ser Gly
 245 250 255

55 Ser Gly Asn Gln Thr Phe Lys Ala Ser Lys Gln Gln Gln Ile Asp Lys
 260 265 270

Ser Ile Tyr Leu Tyr Gly Ser Val Asn Gly Lys Ser Gly Trp Val Ser
 275 280 285

60 Lys Ala Tyr Leu Val Asp Thr Ala Lys Pro Thr Pro Thr Pro Thr Pro
 290 295 300

Lys Pro Ser Thr Pro Thr Thr Asn Asn Lys Leu Thr Val Ser Ser Leu

	305				310					315					320	
5	Asn	Gly	Val	Ala	Gln 325	Ile	Asn	Ala	Lys	Asn 330	Asn	Gly	Leu	Phe	Thr 335	Thr
	Val	Tyr	Asp	Lys 340	Thr	Gly	Lys	Pro	Thr 345	Lys	Glu	Val	Gln	Lys 350	Thr	Phe
10	Ala	Val	Thr 355	Lys	Glu	Ala	Ser	Leu 360	Gly	Gly	Asn	Lys	Phe 365	Tyr	Leu	Val
	Lys	Asp 370	Tyr	Asn	Ser	Pro	Thr 375	Leu	Ile	Gly	Trp	Val 380	Lys	Gln	Gly	Asp
15	Val 385	Ile	Tyr	Asn	Asn	Ala 390	Lys	Ser	Pro	Val	Asn 395	Val	Met	Gln	Thr	Tyr 400
20	Thr	Val	Lys	Pro	Gly 405	Thr	Lys	Leu	Tyr	Ser 410	Val	Pro	Trp	Gly	Thr 415	Tyr
	Lys	Gln	Glu	Ala 420	Gly	Ala	Val	Ser	Gly 425	Thr	Gly	Asn	Gln	Thr 430	Phe	Lys
25	Ala	Thr	Lys 435	Gln	Gln	Gln	Ile	Asp 440	Lys	Ser	Ile	Tyr	Leu 445	Phe	Gly	Thr
	Val	Asn 450	Gly	Lys	Ser	Gly	Trp 455	Val	Ser	Lys	Ala	Tyr 460	Leu	Ala	Val	Pro
30	Ala 465	Ala	Pro	Lys	Lys	Ala 470	Val	Ala	Gln	Pro	Lys 475	Thr	Ala	Val	Lys	Ala 480
35	Tyr	Thr	Val	Thr	Lys 485	Pro	Gln	Thr	Thr	Gln 490	Thr	Val	Ser	Lys	Ile 495	Ala
	Gln	Val	Lys	Pro 500	Asn	Asn	Thr	Gly	Ile 505	Arg	Ala	Ser	Val	Tyr 510	Glu	Lys
40	Thr	Ala	Lys 515	Asn	Gly	Ala	Lys	Tyr 520	Ala	Asp	Arg	Thr	Phe 525	Tyr	Val	Thr
	Lys	Glu 530	Arg	Ala	His	Gly	Asn 535	Glu	Thr	Tyr	Val	Leu 540	Leu	Asn	Asn	Thr
45	Ser 545	His	Asn	Ile	Pro	Leu 550	Gly	Trp	Phe	Asn	Val 555	Lys	Asp	Leu	Asn	Val 560
50	Gln	Asn	Leu	Gly	Lys 565	Glu	Val	Lys	Thr	Thr 570	Gln	Lys	Tyr	Thr	Val 575	Asn
	Lys	Ser	Asn	Asn 580	Gly	Leu	Ser	Met	Val 585	Pro	Trp	Gly	Thr	Lys 590	Asn	Gln
55	Val	Ile	Leu 595	Thr	Gly	Asn	Asn	Ile 600	Ala	Gln	Gly	Thr	Phe 605	Asn	Ala	Thr
	Lys	Gln 610	Val	Ser	Val	Gly	Lys 615	Asp	Val	Tyr	Leu	Tyr 620	Gly	Thr	Ile	Asn
60	Asn 625	Arg	Thr	Gly	Trp	Val 630	Asn	Ala	Lys	Asp	Leu 635	Thr	Ala	Pro	Thr	Ala 640
	Val	Lys	Pro	Thr	Thr	Ser	Ala	Ala	Lys	Asp	Tyr	Asn	Tyr	Thr	Tyr	Val

				645					650						655		
	Ile	Lys	Asn	Gly	Asn	Gly	Tyr	Tyr	Tyr	Val	Thr	Pro	Asn	Ser	Asp	Thr	
				660					665					670			
5	Ala	Lys	Tyr	Ser	Leu	Lys	Ala	Phe	Asn	Glu	Gln	Pro	Phe	Ala	Val	Val	
			675					680					685				
10	Lys	Glu	Gln	Val	Ile	Asn	Gly	Gln	Thr	Trp	Tyr	Tyr	Gly	Lys	Leu	Ser	
		690					695					700					
	Asn	Gly	Lys	Leu	Ala	Trp	Ile	Lys	Ser	Thr	Asp	Leu	Ala	Lys	Glu	Leu	
	705					710					715					720	
15	Ile	Lys	Tyr	Asn	Gln	Thr	Gly	Met	Ala	Leu	Asn	Gln	Val	Ala	Gln	Ile	
				725						730					735		
	Gln	Ala	Gly	Leu	Gln	Tyr	Lys	Pro	Gln	Val	Gln	Arg	Val	Pro	Gly	Lys	
			740					745					750				
20	Trp	Thr	Gly	Ala	Asn	Phe	Asn	Asp	Val	Lys	His	Ala	Met	Asp	Thr	Lys	
			755					760					765				
25	Arg	Leu	Ala	Gln	Asp	Pro	Ala	Leu	Lys	Tyr	Gln	Phe	Leu	Arg	Leu	Asp	
		770					775					780					
	Gln	Pro	Gln	Asn	Ile	Ser	Ile	Asp	Lys	Ile	Asn	Gln	Phe	Leu	Lys	Gly	
	785				790						795					800	
30	Lys	Gly	Val	Leu	Glu	Asn	Gln	Gly	Ala	Ala	Phe	Asn	Lys	Ala	Ala	Gln	
				805					810						815		
	Met	Tyr	Gly	Ile	Asn	Glu	Val	Tyr	Leu	Ile	Ser	His	Ala	Leu	Leu	Glu	
			820					825						830			
35	Thr	Gly	Asn	Gly	Thr	Ser	Gln	Leu	Ala	Lys	Gly	Ala	Asp	Val	Val	Asn	
			835					840					845				
40	Asn	Lys	Val	Val	Thr	Asn	Ser	Asn	Thr	Lys	Tyr	His	Asn	Val	Phe	Gly	
		850					855					860					
	Ile	Ala	Ala	Tyr	Asp	Asn	Asp	Pro	Leu	Arg	Glu	Gly	Ile	Lys	Tyr	Ala	
	865					870					875					880	
45	Lys	Gln	Ala	Gly	Trp	Asp	Thr	Val	Ser	Lys	Ala	Ile	Val	Gly	Gly	Ala	
				885						890					895		
	Lys	Phe	Ile	Gly	Asn	Ser	Tyr	Val	Lys	Ala	Gly	Gln	Asn	Thr	Leu	Tyr	
			900						905					910			
50	Lys	Met	Arg	Trp	Asn	Pro	Ala	His	Pro	Gly	Thr	His	Gln	Tyr	Ala	Thr	
			915					920					925				
55	Asp	Val	Asp	Trp	Ala	Asn	Ile	Asn	Ala	Lys	Ile	Ile	Lys	Gly	Tyr	Tyr	
		930					935					940					
	Asp	Lys	Ile	Gly	Glu	Val	Gly	Lys	Tyr	Phe	Asp	Ile	Pro	Gln	Tyr	Lys	
	945					950					955					960	
60																	

<210> 16
 <211> 386
 <212> PRT
 <213> Staphylococcus aureus

5

<400> 16
 Asp Gln Tyr Ser Glu Asp Ala Lys Lys Thr Gln Lys Asp Tyr Ala Ser
 1 5 10 15

10

Gln Ser Lys Lys Asp Lys Asn Glu Lys Ser Asn Thr Lys Asn Pro Gln
 20 25 30

Leu Pro Thr Gln Asp Glu Leu Lys His Lys Ser Lys Pro Ala Gln Ser
 35 40 45

15

Phe Asn Asn Asp Val Asn Gln Lys Asp Thr Arg Ala Thr Ser Leu Phe
 50 55 60

Glu Thr Asp Pro Ser Ile Ser Asn Asn Asp Asp Ser Gly Gln Phe Asn
 65 70 75 80

Val Val Asp Ser Lys Asp Thr Arg Gln Phe Val Lys Ser Ile Ala Lys
 85 90 95

20

Asp Ala His Arg Ile Gly Gln Asp Asn Asp Ile Tyr Ala Ser Val Met
 100 105 110

Ile Ala Gln Ala Ile Leu Glu Ser Asp Ser Gly Arg Ser Ala Leu Ala
 115 120 125

30

Lys Ser Pro Asn His Asn Leu Phe Gly Ile Lys Gly Ala Phe Glu Gly
 130 135 140

Asn Ser Val Pro Phe Asn Thr Leu Glu Ala Asp Gly Asn Gln Leu Tyr
 145 150 155 160

35

Ser Ile Asn Ala Gly Phe Arg Lys Tyr Pro Ser Thr Lys Glu Ser Leu
 165 170 175

Lys Asp Tyr Ser Asp Leu Ile Lys Asn Gly Ile Asp Gly Asn Arg Thr
 180 185 190

40

Ile Tyr Lys Pro Thr Trp Lys Ser Glu Ala Asp Ser Tyr Lys Asp Ala
 195 200 205

45

Thr Ser His Leu Ser Lys Thr Tyr Ala Thr Asp Pro Asn Tyr Ala Lys
 210 215 220

Lys Leu Asn Ser Ile Ile Lys His Tyr Gln Leu Thr Gln Phe Asp Asp
 225 230 235 240

50

Glu Arg Met Pro Asp Leu Asp Lys Tyr Glu Arg Ser Ile Lys Asp Tyr
 245 250 255

Asp Asp Ser Ser Asp Glu Phe Lys Pro Phe Arg Glu Val Ser Asp Ser
 260 265 270

55

Met Pro Tyr Pro His Gly Gln Cys Thr Trp Tyr Val Tyr Asn Arg Met
 275 280 285

60

Lys Gln Phe Gly Thr Ser Ile Ser Gly Asp Leu Gly Asp Ala His Asn
 290 295 300

Trp Asn Asn Arg Ala Gln Tyr Arg Asp Tyr Gln Val Ser His Thr Pro
 305 310 315 320
 5 Lys Arg His Ala Ala Val Val Phe Glu Ala Gly Gln Phe Gly Ala Asp
 325 330 335
 Gln His Tyr Gly His Val Ala Phe Val Glu Lys Val Asn Ser Asp Gly
 340 345 350
 10 Ser Ile Val Ile Ser Glu Ser Asn Val Lys Gly Leu Gly Ile Ile Ser
 355 360 365
 His Arg Thr Ile Asn Ala Ala Ala Glu Glu Leu Ser Tyr Ile Thr
 370 375 380
 15 Gly Lys
 385
 20 <210> 17
 <211> 325
 <212> PRT
 <213> Staphylococcus aureus
 25 <400> 17
 Met Lys Met Asn Lys Leu Val Lys Ser Ser Val Ala Thr Ser Met Ala
 1 5 10 15
 30 Leu Leu Leu Leu Ser Gly Thr Ala Asn Ala Glu Gly Lys Ile Thr Pro
 20 25 30
 Val Ser Val Lys Lys Val Asp Asp Lys Val Thr Leu Tyr Lys Thr Thr
 35 40 45
 35 Ala Thr Ala Asp Ser Asp Lys Phe Lys Ile Ser Gln Ile Leu Thr Phe
 50 55 60
 Asn Phe Ile Lys Asp Lys Ser Tyr Asp Lys Asp Thr Leu Val Leu Lys
 65 70 75 80
 40 Ala Thr Gly Asn Ile Asn Ser Gly Phe Val Lys Pro Asn Pro Asn Asp
 85 90 95
 45 Tyr Asp Phe Ser Lys Leu Tyr Trp Gly Ala Lys Tyr Asn Val Ser Ile
 100 105 110
 Ser Ser Gln Ser Asn Asp Ser Val Asn Val Val Asp Tyr Ala Pro Lys
 115 120 125
 50 Asn Gln Asn Glu Glu Phe Gln Val Gln Asn Thr Leu Gly Tyr Thr Phe
 130 135 140
 Gly Gly Asp Ile Ser Ile Ser Asn Gly Leu Ser Gly Gly Leu Asn Gly
 145 150 155 160
 55 Asn Thr Ala Phe Ser Glu Thr Ile Asn Tyr Lys Gln Glu Ser Tyr Arg
 165 170 175
 60 Thr Thr Leu Ser Arg Asn Thr Asn Tyr Lys Asn Val Gly Trp Gly Val
 180 185 190
 Glu Ala His Lys Ile Met Asn Asn Gly Trp Gly Pro Tyr Gly Arg Asp
 195 200 205

Ser Phe His Pro Thr Tyr Gly Asn Glu Leu Phe Leu Ala Gly Arg Gln
 210 215 220
 5 Ser Ser Ala Tyr Ala Gly Gln Asn Phe Ile Ala Gln His Gln Met Pro
 225 230 235 240
 Leu Leu Ser Arg Ser Asn Phe Asn Pro Glu Phe Leu Ser Val Leu Ser
 245 250 255
 10 His Arg Gln Asp Gly Ala Lys Lys Ser Lys Ile Thr Val Thr Tyr Gln
 260 265 270
 Arg Glu Met Asp Leu Tyr Gln Ile Arg Trp Asn Gly Phe Tyr Trp Ala
 275 280 285
 15 Gly Ala Asn Tyr Lys Asn Phe Lys Thr Arg Thr Phe Lys Ser Thr Tyr
 290 295 300
 20 Glu Ile Asp Trp Glu Asn His Lys Val Lys Leu Leu Asp Thr Lys Glu
 305 310 315 320
 Thr Glu Asn Asn Lys
 325
 25
 <210> 18
 <211> 157
 <212> PRT
 30 <213> Staphylococcus aureus
 <400> 18
 Ser Phe Asn Tyr Ser Lys Ser Ile Ser Tyr Thr Gln Gln Asn Tyr Val
 1 5 10 15
 35 Ser Glu Val Glu Gln Gln Asn Ser Lys Ser Val Leu Trp Gly Val Lys
 20 25 30
 Ala Asn Ser Phe Ala Thr Glu Ser Gly Gln Lys Ser Ala Phe Asp Ser
 35 40 45
 Asp Leu Phe Val Gly Tyr Lys Pro His Ser Lys Asp Pro Arg Asp Tyr
 50 55 60
 45 Phe Val Pro Asp Ser Glu Leu Pro Pro Leu Val Gln Ser Gly Phe Asn
 65 70 75 80
 Pro Ser Phe Ile Ala Thr Val Ser His Glu Lys Gly Ser Ser Asp Thr
 85 90 95
 50 Ser Glu Phe Glu Ile Thr Tyr Gly Arg Asn Met Asp Val Thr His Ala
 100 105 110
 Ile Lys Arg Ser Thr His Tyr Gly Asn Ser Tyr Leu Asp Gly His Arg
 115 120 125
 Val His Asn Ala Phe Val Asn Arg Asn Tyr Thr Val Lys Tyr Glu Val
 130 135 140
 60 Asn Trp Lys Thr His Glu Ile Lys Val Lys Gly Gln Asn
 145 150 155

<210> 19
 <211> 345
 <212> PRT
 <213> Staphylococcus aureus

5

<400> 19
 Ile Ile Ala Ile Ile Ile Leu Ile Phe Ile Ser Phe Phe Phe Ser Gly
 1 5 10 15

10

Ser Glu Thr Ala Leu Thr Ala Ala Asn Lys Ala Lys Phe Lys Thr Glu
 20 25 30

Ala Asp Lys Gly Asp Lys Lys Ala Lys Gly Ile Val Lys Leu Leu Glu
 35 40 45

15

Lys Pro Ser Glu Phe Ile Thr Thr Ile Leu Ile Gly Asn Asn Val Ala
 50 55 60

20

Asn Ile Leu Leu Pro Thr Leu Val Thr Ile Met Ala Leu Arg Trp Gly
 65 70 75 80

Ile Ser Val Gly Ile Ala Ser Ala Val Leu Thr Val Val Ile Ile Leu
 85 90 95

25

Ile Ser Glu Val Ile Pro Lys Ser Val Ala Ala Thr Phe Pro Asp Lys
 100 105 110

Ile Thr Arg Leu Val Tyr Pro Ile Ile Asn Ile Cys Val Ile Val Phe
 115 120 125

30

Arg Pro Ile Thr Leu Leu Leu Asn Lys Leu Thr Asp Ser Ile Asn Arg
 130 135 140

35

Ser Leu Ser Lys Gly Gln Pro Gln Glu His Gln Phe Ser Lys Glu Glu
 145 150 155 160

Phe Lys Thr Met Leu Ala Ile Ala Gly His Glu Gly Ala Leu Asn Glu
 165' 170 175

40

Ile Glu Thr Ser Arg Leu Glu Gly Val Ile Asn Phe Glu Asn Leu Lys
 180 185 190

Val Lys Asp Val Asp Thr Thr Pro Arg Ile Asn Val Thr Ala Phe Ala
 195 200 205

45

Ser Asn Ala Thr Tyr Glu Glu Val Tyr Glu Thr Val Met Asn Lys Pro
 210 215 220

50

Tyr Thr Arg Tyr Pro Val Tyr Glu Gly Asp Ile Asp Asn Ile Ile Gly
 225 230 235 240

Val Phe His Ser Lys Tyr Leu Leu Ala Trp Ser Asn Lys Lys Glu Asn
 245 250 255

55

Gln Ile Thr Asn Tyr Ser Ala Lys Pro Leu Phe Val Asn Glu His Asn
 260 265 270

Lys Ala Glu Trp Val Leu Arg Lys Met Thr Ile Ser Arg Lys His Leu
 275 280 285

60

Ala Ile Val Leu Asp Glu Phe Gly Gly Thr Glu Ala Ile Val Ser His
 290 295 300

Glu Asp Leu Ile Glu Glu Leu Leu Gly Met Glu Ile Glu Asp Glu Met
 305 310 315 320
 5 Asp Lys Lys Glu Lys Glu Lys Leu Ser Gln Gln Gln Ile Gln Phe Gln
 325 330 335
 Gln Arg Lys Asn Arg Asn Val Ser Ile
 340 345
 10
 <210> 20
 <211> 133
 <212> PRT
 <213> Staphylococcus aureus
 15
 <400> 20
 Met Asn Lys Gln Gln Lys Glu Phe Lys Ser Phe Tyr Ser Ile Arg Lys
 1 5 10 15
 20 Ser Ser Leu Gly Val Ala Ser Val Ala Ile Ser Thr Leu Leu Leu Leu
 20 25 30
 Met Ser Asn Gly Glu Ala Gln Ala Ala Glu Glu Thr Gly Gly Thr
 35 40 45
 25 Asn Thr Glu Ala Gln Pro Lys Thr Glu Ala Val Ala Ser Pro Thr Thr
 50 55 60
 Thr Ser Glu Lys Ala Pro Glu Thr Lys Pro Val Ala Asn Ala Val Ser
 65 70 75 80
 Val Ser Asn Lys Glu Val Glu Ala Pro Thr Ser Glu Thr Lys Glu Ala
 85 90 95
 35 Lys Glu Val Lys Glu Val Lys Ala Pro Lys Glu Thr Lys Glu Val Lys
 100 105 110
 Pro Ala Ala Lys Ala Thr Asn Asn Thr Tyr Pro Ile Leu Asn Gln Glu
 115 120 125
 40 Leu Ile Arg Ser Asp
 130
 45
 <210> 21
 <211> 205
 <212> PRT
 <213> Staphylococcus aureus
 50
 <400> 21
 Asp His Gly Ile Val Phe Asn Ala Ser Leu Pro Leu Tyr Lys Asp Ala
 1 5 10 15
 55 Ile His Gln Lys Gly Ser Met Arg Ser Asn Asp Asn Gly Asp Asp Met
 20 25 30
 Ser Met Met Val Gly Thr Val Leu Ser Gly Phe Glu Tyr Arg Ala Gln
 35 40 45
 60 Lys Glu Lys Tyr Asp Asn Leu Tyr Lys Phe Phe Lys Glu Asn Glu Lys
 50 55 60
 Lys Tyr Gln Tyr Thr Gly Phe Thr Lys Glu Ala Ile Asn Lys Thr Gln

	65		70		75		80									
	Asn	Val	Gly	Tyr	Lys	Asn	Glu	Tyr	Phe	Tyr	Ile	Thr	Tyr	Ser	Ser	Arg
					85					90					95	
5	Ser	Leu	Lys	Glu	Tyr	Arg	Lys	Tyr	Tyr	Glu	Pro	Leu	Ile	Arg	Lys	Asn
				100					105					110		
10	Asp	Lys	Glu	Phe	Lys	Glu	Gly	Met	Glu	Arg	Ala	Arg	Lys	Glu	Val	Asn
			115					120					125			
	Tyr	Ala	Ala	Asn	Thr	Asp	Ala	Val	Ala	Thr	Leu	Phe	Ser	Thr	Lys	Lys
		130					135					140				
15	Asn	Phe	Thr	Lys	Asp	Asn	Thr	Val	Asp	Asp	Val	Ile	Glu	Leu	Ser	Asp
	145					150					155					160
	Lys	Leu	Tyr	Asn	Leu	Lys	Asn	Lys	Pro	Asp	Lys	Ser	Thr	Ile	Thr	Ile
				165						170					175	
20	Gln	Ile	Gly	Lys	Pro	Thr	Ile	Asn	Thr	Lys	Lys	Ala	Phe	Tyr	Asp	Asp
				180					185					190		
25	Asn	Arg	Pro	Ile	Glu	Tyr	Gly	Val	His	Ser	Lys	Asp	Glu			
			195					200					205			
	<210> 22															
	<211> 510															
30	<212> PRT															
	<213> Staphylococcus aureus															
	<400> 22															
35	Asp	His	Tyr	Val	Ile	Gln	Tyr	Phe	Ser	Gly	Leu	Ile	Gly	Gly	Arg	Gly
	1				5					10					15	
	Arg	Arg	Ala	Asn	Leu	Tyr	Gly	Leu	Phe	Asn	Lys	Ala	Ile	Glu	Phe	Glu
				20					25					30		
40	Asn	Ser	Ser	Phe	Arg	Gly	Leu	Tyr	Gln	Phe	Ile	Arg	Phe	Ile	Asp	Glu
			35				40						45			
	Leu	Ile	Glu	Arg	Gly	Lys	Asp	Phe	Gly	Glu	Glu	Asn	Val	Val	Gly	Pro
	50						55					60				
45	Asn	Asp	Asn	Val	Val	Arg	Met	Met	Thr	Ile	His	Ser	Ser	Lys	Gly	Leu
	65					70					75					80
	Glu	Phe	Pro	Phe	Val	Ile	Tyr	Ser	Gly	Leu	Ser	Lys	Asp	Phe	Asn	Lys
50					85					90					95	
	Arg	Asp	Leu	Lys	Gln	Pro	Val	Ile	Leu	Asn	Gln	Gln	Phe	Gly	Leu	Gly
				100					105					110		
55	Met	Asp	Tyr	Phe	Asp	Val	Asp	Lys	Glu	Met	Ala	Phe	Pro	Ser	Leu	Ala
			115					120					125			
	Ser	Val	Ala	Tyr	Arg	Ala	Val	Ala	Glu	Lys	Glu	Leu	Val	Ser	Glu	Glu
		130					135					140				
60	Met	Arg	Leu	Val	Tyr	Val	Ala	Leu	Thr	Arg	Ala	Lys	Glu	Gln	Leu	Tyr
	145					150					155					160

	Leu	Ile	Gly	Arg	Val	Lys	Asn	Asp	Lys	Ser	Leu	Leu	Glu	Leu	Glu	Gln
					165					170					175	
5	Leu	Ser	Ile	Ser	Gly	Glu	His	Ile	Ala	Val	Asn	Glu	Arg	Leu	Thr	Ser
				180					185					190		
	Pro	Asn	Pro	Phe	His	Leu	Ile	Tyr	Ser	Ile	Leu	Ser	Lys	His	Gln	Ser
			195					200					205			
10	Ala	Ser	Ile	Pro	Asp	Asp	Leu	Lys	Phe	Glu	Lys	Asp	Ile	Ala	Gln	Ile
		210					215					220				
	Glu	Asp	Ser	Ser	Arg	Pro	Asn	Val	Asn	Ile	Ser	Ile	Val	Tyr	Phe	Glu
	225					230					235					240
15	Asp	Val	Ser	Thr	Glu	Thr	Ile	Leu	Asp	Asn	Asp	Glu	Tyr	Arg	Ser	Val
					245					250					255	
	Asn	Gln	Leu	Glu	Thr	Met	Gln	Asn	Gly	Asn	Glu	Asp	Val	Lys	Ala	Gln
20				260					265					270		
	Ile	Lys	His	Gln	Leu	Asp	Tyr	Arg	Tyr	Pro	Tyr	Val	Asn	Asp	Thr	Lys
			275					280					285			
25	Lys	Pro	Ser	Lys	Gln	Ser	Val	Ser	Glu	Leu	Lys	Arg	Gln	Tyr	Glu	Thr
		290					295					300				
	Glu	Glu	Ser	Gly	Thr	Ser	Tyr	Glu	Arg	Val	Arg	Gln	Tyr	Arg	Ile	Gly
	305					310				315						320
30	Phe	Ser	Thr	Tyr	Glu	Arg	Pro	Lys	Phe	Leu	Ser	Glu	Gln	Gly	Lys	Arg
					325					330					335	
	Lys	Ala	Asn	Glu	Ile	Gly	Thr	Leu	Met	His	Thr	Val	Met	Gln	His	Leu
35				340					345					350		
	Pro	Phe	Lys	Lys	Glu	Arg	Ile	Ser	Glu	Val	Glu	Leu	His	Gln	Tyr	Ile
			355					360					365			
40	Asp	Gly	Leu	Ile	Asp	Lys	His	Ile	Ile	Glu	Ala	Asp	Ala	Lys	Lys	Asp
		370					375					380				
	Ile	Arg	Met	Asp	Glu	Ile	Met	Thr	Phe	Ile	Asn	Ser	Glu	Leu	Tyr	Ser
	385					390					395					400
45	Ile	Ile	Ala	Glu	Ala	Glu	Gln	Val	Tyr	Arg	Glu	Leu	Pro	Phe	Val	Val
					405					410					415	
	Asn	Gln	Ala	Leu	Val	Asp	Gln	Leu	Pro	Gln	Gly	Asp	Glu	Asp	Val	Ser
50				420					425					430		
	Ile	Ile	Gln	Gly	Met	Ile	Asp	Leu	Ile	Phe	Val	Lys	Asp	Gly	Val	His
			435					440					445			
55	Tyr	Phe	Val	Asp	Tyr	Lys	Thr	Asp	Ala	Phe	Asn	Arg	Arg	Arg	Gly	Met
		450					455					460				
	Thr	Asp	Glu	Glu	Ile	Gly	Thr	Gln	Leu	Lys	Asn	Lys	Tyr	Lys	Ile	Gln
	465					470					475					480
60	Met	Lys	Tyr	Tyr	Gln	Asn	Thr	Leu	Gln	Thr	Ile	Leu	Asn	Lys	Glu	Val
					485					490					495	

Lys Gly Tyr Leu Tyr Phe Phe Lys Phe Gly Thr Leu Gln Leu
 500 505 510

5 <210> 23
 <211> 124
 <212> PRT
 <213> Staphylococcus aureus

10 <400> 23
 Met Lys Phe Leu Ser Phe Lys Tyr Asn Asp Lys Thr Ser Tyr Gly Val
 1 5 10 15

15 Lys Val Lys Arg Glu Asp Ala Val Trp Asp Leu Thr Gln Val Phe Ala
 20 25 30

Asp Phe Ala Glu Gly Asp Phe His Pro Lys Thr Leu Leu Ala Gly Leu
 35 40 45

20 Gln Gln Asn His Thr Leu Asp Phe Gln Glu Gln Val Arg Lys Ala Val
 50 55 60

Val Ala Ala Glu Asp Ser Gly Lys Ala Glu Asp Tyr Lys Ile Ser Phe
 65 70 75 80

25 Asn Asp Ile Glu Phe Leu Pro Pro Val Thr Pro Pro Asn Asn Val Ile
 85 90 95

30 Ala Phe Gly Arg Asn Tyr Lys Asp His Ala Asn Glu Leu Asn His Glu
 100 105 110

Val Glu Lys Leu Tyr Val Phe Thr Lys Ala Ala Ser
 115 120

35 <210> 24
 <211> 180
 <212> PRT
 <213> Staphylococcus aureus

40 <400> 24
 Ser Gly Thr Gly Phe Ile Val Gly Lys Asn Thr Ile Val Thr Asn Lys
 1 5 10 15

45 His Val Val Ala Gly Met Glu Ile Gly Ala His Ile Ile Ala His Pro
 20 25 30

Asn Gly Glu Tyr Asn Asn Gly Gly Phe Tyr Lys Val Lys Lys Ile Val
 35 40 45

50 Arg Tyr Ser Gly Gln Glu Asp Ile Ala Ile Leu His Val Glu Asp Lys
 50 55 60

55 Ala Val His Pro Lys Asn Arg Asn Phe Lys Asp Tyr Thr Gly Ile Leu
 65 70 75 80

Lys Ile Ala Ser Glu Ala Lys Glu Asn Glu Arg Ile Ser Ile Val Gly
 85 90 95

60 Tyr Pro Glu Pro Tyr Ile Asn Lys Phe Gln Met Tyr Glu Ser Thr Gly
 100 105 110

Lys Val Leu Ser Val Lys Gly Asn Met Ile Ile Thr Asp Ala Phe Val

	115	120	125
	Glu Pro Gly Asn Ser Gly Ser	Ala Val Phe Asn Ser	Lys Tyr Glu Val
	130	135	140
5	Val Gly Val His Phe Gly Gly	Asn Gly Pro Gly	Asn Lys Ser Thr Lys
	145	150	155 160
10	Gly Tyr Gly Val Tyr Phe Ser Pro Glu Ile	Lys Lys Phe Ile	Ala Asp
	165	170	175
	Asn Thr Asp Lys		
	180		
15	<210> 25 <211> 239 <212> PRT <213> Staphylococcus aureus		
20	<400> 25 Met Asn Lys Asn Ile Ile Ile Lys Ser Ile Ala Ala Leu Thr Ile Leu		
	1	5	10 15
25	Thr Ser Ile Thr Gly Val Gly Thr Thr	Met Val Glu Gly Ile Gln Gln	
	20	25	30
	Thr Ala Lys Ala Glu Asn Thr Val Lys Gln Ile Thr Asn Thr Asn Val		
	35	40	45
30	Ala Pro Tyr Ser Gly Val Thr Trp Met Gly Ala Gly Thr Gly Phe Val		
	50	55	60
35	Val Gly Asn His Thr Ile Ile Thr Asn Lys His Val Thr Tyr His Met		
	65	70	75 80
	Lys Val Gly Asp Glu Ile Lys Ala His Pro Asn Gly Phe Tyr Asn Asn		
	85	90	95
40	Gly Gly Gly Leu Tyr Lys Val Thr Lys Ile Val Asp Tyr Pro Gly Lys		
	100	105	110
	Glu Asp Ile Ala Val Val Gln Val Glu Glu Lys Ser Thr Gln Pro Lys		
	115	120	125
45	Gly Arg Lys Phe Lys Asp Phe Thr Ser Lys Phe Asn Ile Ala Ser Glu		
	130	135	140
50	Ala Lys Glu Asn Glu Pro Ile Ser Val Ile Gly Tyr Pro Asn Pro Asn		
	145	150	155 160
	Gly Asn Lys Leu Gln Met Tyr Glu Ser Thr Gly Lys Val Leu Ser Val		
	165	170	175
55	Asn Gly Asn Ile Val Ser Ser Asp Ala Ile Ile Gln Pro Gly Ser Ser		
	180	185	190
	Gly Ser Pro Ile Leu Asn Ser Lys His Glu Ala Ile Gly Val Ile Tyr		
	195	200	205
60	Ala Gly Asn Lys Pro Ser Gly Glu Ser Thr Arg Gly Phe Ala Val Tyr		
	210	215	220

Phe Ser Pro Glu Ile Lys Lys Phe Ile Ala Asp Asn Leu Asp Lys
 225 230 235

5 <210> 26
 <211> 470
 <212> PRT
 <213> Staphylococcus aureus

10 <400> 26
 Met Gly Cys Thr Val Lys Met Asn Lys Ile Asn Asp Arg Asp Leu Thr
 1 5 10 15

15 Glu Leu Ser Ser Tyr Trp Val Tyr Gln Asn Ile Asp Ile Lys Lys Glu
 20 25 30

Phe Lys Val Asn Gly Lys Arg Phe Lys Gln Val Asp Ser Tyr Asn Asp
 35 40 45

20 Asp Lys Asn Ser Asn Leu Asn Gly Ala Ala Asp Ile Lys Ile Tyr Glu
 50 55 60

Leu Leu Asp Asp Lys Ser Lys Pro Thr Gly Gln Gln Thr Ile Ile Tyr
 65 70 75 80

25 Gln Gly Thr Ser Asn Glu Ala Ile Asn Pro Asn Asn Pro Leu Lys Ser
 85 90 95

30 Ser Gly Phe Gly Asp Asp Trp Leu Gln Asn Ala Lys Leu Met Asn Asn
 100 105 110

Asp Asn Glu Ser Thr Asp Tyr Leu Lys Gln Thr Asp Gln Leu Ser Asn
 115 120 125

35 Gln Tyr Lys Ile Lys Leu Glu Asp Ala Asp Arg Leu Ser Asn Ser Asp
 130 135 140

Phe Leu Lys Lys Tyr Arg Met Glu Ser Ser Asn Phe Lys Asn Lys Thr
 145 150 155 160

40 Ile Val Ala Asp Gly Gly Asn Ser Glu Gly Gly Ala Gly Ala Lys Tyr
 165 170 175

45 Gln Gly Ala Lys His Pro Asn Glu Lys Val Val Ala Thr Asp Ser Ala
 180 185 190

Met Ile Pro Tyr Ala Ala Trp Gln Lys Phe Ala Arg Pro Arg Phe Asp
 195 200 205

50 Asn Met Ile Ser Phe Asn Ser Thr Asn Asp Leu Leu Thr Trp Leu Gln
 210 215 220

Asp Pro Phe Ile Lys Asp Met Pro Gly Lys Arg Val Asn Ile Asn Asp
 225 230 235 240

55 Gly Val Pro Arg Leu Asp Thr Leu Ile Asp Ser His Val Gly Tyr Lys
 245 250 255

60 Arg Lys Leu Asn Arg Lys Asp Asn Thr Tyr Asp Thr Val Pro Leu Ile
 260 265 270

Lys Ile Lys Ser Val Lys Asp Thr Glu Ile Lys Asn Gly Lys Lys Val
 275 280 285

Lys Lys Thr Ile Asn Ile Thr Leu Asp Met Asp Gly Arg Ile Pro Ile
 290 295 300
 5 Asn Val Trp Thr Gly Asp Ser Ile Ala Arg Ser Gly Arg Gly Thr Leu
 305 310 315 320
 Ile Lys Leu Asn Leu Glu Asn Leu Asp Ala Leu Ser Lys Leu Ile Thr
 325 330 335
 10 Gly Glu Thr Ser Gly Met Leu Ala Glu Cys Val Ile Phe Leu Asn Glu
 340 345 350
 Ser Phe Asn Ile Ser Glu Asn Glu Asn Lys Asn Phe Ala Asp Arg Lys
 355 360 365
 15 Lys Gln Leu Ser Glu Gly Phe Lys Asp Lys Ile Asn Leu Phe Gln Leu
 370 375 380
 20 Glu Glu Met Glu Arg Thr Leu Ile Ser Lys Ile Asn Ser Leu Glu Glu
 385 390 395 400
 Val Ala Asp Glu Thr Ile Glu Ser Ile Ser Ala Val Lys His Leu Leu
 405 410 415
 25 Pro Asp Phe Ala Leu Asp Ala Leu Lys Glu Arg Ile Asn Glu Leu Phe
 420 425 430
 Lys Gly Ile Lys Ser Phe Ile Glu Lys Val Tyr Asp Ser Ile Asp Asn
 435 440 445
 30 Glu Ile Leu Glu Ile Phe Lys Asn Ile Asp His Asp Phe Arg Asp Gly
 450 455 460
 35 Val Ser Glu Glu Met Met
 465 470
 40 <210> 27
 <211> 306
 <212> PRT
 <213> Staphylococcus aureus
 <400> 27
 45 Met Lys Lys Lys Asp Gly Thr Gln Gln Phe Tyr His Tyr Ala Ser Ser
 1 5 10 15
 Val Lys Pro Ala Arg Val Ile Phe Thr Asp Ser Lys Pro Glu Ile Glu
 20 25 30
 50 Leu Gly Leu Gln Ser Gly Gln Phe Trp Arg Lys Phe Glu Val Tyr Glu
 35 40 45
 Gly Asp Lys Lys Leu Pro Ile Lys Leu Val Ser Tyr Asp Thr Val Lys
 50 55 60
 Asp Tyr Ala Tyr Ile Arg Phe Ser Val Ser Asn Gly Thr Lys Ala Val
 65 70 75 80
 60 Lys Ile Val Ser Ser Thr His Phe Asn Asn Lys Glu Glu Lys Tyr Asp
 85 90 95
 Tyr Thr Leu Met Glu Phe Ala Gln Pro Ile Tyr Asn Ser Ala Asp Lys

	100	105	110
	Phe Lys Thr Glu Glu Asp Tyr	Lys Ala Glu Lys Leu Leu Ala Pro Tyr	
5	115	120	125
	Lys Lys Ala Lys Thr Leu Glu Arg Gln Val Tyr Glu Leu Asn Lys Ile		
	130	135	140
10	Gln Asp Lys Leu Pro Glu Lys Leu Lys Ala Glu Tyr Lys Lys Lys Leu		
	145	150	155
	Glu Asp Thr Lys Lys Ala Leu Asp Glu Gln Val Lys Ser Ala Ile Thr		
	165	170	175
15	Glu Phe Gln Asn Val Gln Pro Thr Asn Glu Lys Met Thr Asp Leu Gln		
	180	185	190
	Asp Thr Lys Tyr Val Val Tyr Glu Ser Val Glu Asn Asn Glu Ser Met		
20	195	200	205
	Met Asp Thr Phe Val Lys His Pro Ile Lys Thr Gly Met Leu Asn Gly		
	210	215	220
25	Lys Lys Tyr Met Val Met Glu Thr Thr Asn Asp Asp Tyr Trp Lys Asp		
	225	230	235
	Phe Met Val Glu Gly Gln Arg Val Arg Thr Ile Ser Lys Asp Ala Lys		
	245	250	255
30	Asn Asn Thr Arg Thr Ile Ile Phe Pro Tyr Val Glu Gly Lys Thr Leu		
	260	265	270
	Tyr Asp Ala Ile Val Lys Val His Val Lys Thr Ile Asp Tyr Asp Gly		
35	275	280	285
	Gln Tyr His Val Arg Ile Val Asp Lys Glu Ala Phe Thr Lys Ala His		
	290	295	300
40	Thr Asp		
	305		
45	<210> 28		
	<211> 2659		
	<212> PRT		
	<213> Staphylococcus aureus		
50	<400> 28		
	Asp Gln Thr Thr Ile Ile Asn Ser Leu Thr Phe Thr Glu Thr Val Pro		
	1	5	10
	Asn Arg Ser Tyr Ala Arg Ala Ser Ala Asn Glu Ile Thr Ser Lys Thr		
	20	25	30
55	Val Ser Asn Val Ser Arg Thr Gly Asn Asn Ala Asn Val Thr Val Thr		
	35	40	45
60	Val Thr Tyr Gln Asp Gly Thr Thr Ser Thr Val Thr Val Pro Val Lys		
	50	55	60
	His Val Ile Pro Glu Ile Val Ala His Ser His Tyr Thr Val Gln Gly		
	65	70	75
			80

	Gln	Asp	Phe	Pro	Ala	Gly	Asn	Gly	Ser	Ser	Ala	Ser	Asp	Tyr	Phe	Lys
					85					90					95	
5	Leu	Ser	Asn	Gly	Ser	Asp	Ile	Ala	Asp	Ala	Thr	Ile	Thr	Trp	Val	Ser
				100					105					110		
	Gly	Gln	Ala	Pro	Asn	Lys	Asp	Asn	Thr	Arg	Ile	Gly	Glu	Asp	Ile	Thr
			115					120					125			
10	Val	Thr	Ala	His	Ile	Leu	Ile	Asp	Gly	Glu	Thr	Thr	Pro	Ile	Thr	Lys
		130					135					140				
	Thr	Ala	Thr	Tyr	Lys	Val	Val	Arg	Thr	Val	Pro	Lys	His	Val	Phe	Glu
15		145				150					155					160
	Thr	Ala	Arg	Gly	Val	Leu	Tyr	Pro	Gly	Val	Ser	Asp	Met	Tyr	Asp	Ala
					165					170					175	
20	Lys	Gln	Tyr	Val	Lys	Pro	Val	Asn	Asn	Ser	Trp	Ser	Thr	Asn	Ala	Gln
				180					185					190		
	His	Met	Asn	Phe	Gln	Phe	Val	Gly	Thr	Tyr	Gly	Pro	Asn	Lys	Asp	Val
			195					200					205			
25	Val	Gly	Ile	Ser	Thr	Arg	Leu	Ile	Arg	Val	Thr	Tyr	Asp	Asn	Arg	Gln
		210					215					220				
	Thr	Glu	Asp	Leu	Thr	Ile	Leu	Ser	Lys	Val	Lys	Pro	Asp	Pro	Pro	Arg
30		225				230					235					240
	Ile	Asp	Ala	Asn	Ser	Val	Thr	Tyr	Lys	Ala	Gly	Leu	Thr	Asn	Gln	Glu
					245					250					255	
35	Ile	Lys	Val	Asn	Asn	Val	Leu	Asn	Asn	Ser	Ser	Val	Lys	Leu	Phe	Lys
				260					265					270		
	Ala	Asp	Asn	Thr	Pro	Leu	Asn	Val	Thr	Asn	Ile	Thr	His	Gly	Ser	Gly
			275					280					285			
40	Phe	Ser	Ser	Val	Val	Thr	Val	Ser	Asp	Ala	Leu	Pro	Asn	Gly	Gly	Ile
		290					295					300				
	Lys	Ala	Lys	Ser	Ser	Ile	Ser	Met	Asn	Asn	Val	Thr	Tyr	Thr	Thr	Gln
45		305				310					315					320
	Asp	Glu	His	Gly	Gln	Val	Val	Thr	Val	Thr	Arg	Asn	Glu	Ser	Val	Asp
					325					330					335	
50	Ser	Asn	Asp	Ser	Ala	Thr	Val	Thr	Val	Thr	Pro	Gln	Leu	Gln	Ala	Thr
				340					345					350		
	Thr	Glu	Gly	Ala	Val	Phe	Ile	Lys	Gly	Gly	Asp	Gly	Phe	Asp	Phe	Gly
			355					360					365			
55	His	Val	Glu	Arg	Phe	Ile	Gln	Asn	Pro	Pro	His	Gly	Ala	Thr	Val	Ala
		370					375					380				
	Trp	His	Asp	Ser	Pro	Asp	Thr	Trp	Lys	Asn	Thr	Val	Gly	Asn	Thr	His
60		385				390					395					400
	Lys	Thr	Ala	Val	Val	Thr	Leu	Pro	Asn	Gly	Gln	Gly	Thr	Arg	Asn	Val
					405					410					415	

	Glu	Val	Pro	Val	Lys	Val	Tyr	Pro	Val	Ala	Asn	Ala	Lys	Ala	Pro	Ser
				420					425					430		
5	Arg	Asp	Val	Lys	Gly	Gln	Asn	Leu	Thr	Asn	Gly	Thr	Asp	Ala	Met	Asn
			435					440					445			
	Tyr	Ile	Thr	Phe	Asp	Pro	Asn	Thr	Asn	Thr	Asn	Gly	Ile	Thr	Ala	Ala
		450					455					460				
10	Trp	Ala	Asn	Arg	Gln	Gln	Pro	Asn	Asn	Gln	Gln	Ala	Gly	Val	Gln	His
	465					470					475					480
	Leu	Asn	Val	Asp	Val	Thr	Tyr	Pro	Gly	Ile	Ser	Ala	Ala	Lys	Arg	Val
					485					490					495	
15	Pro	Val	Thr	Val	Asn	Val	Tyr	Gln	Phe	Glu	Phe	Pro	Gln	Thr	Thr	Tyr
				500					505					510		
	Thr	Thr	Thr	Val	Gly	Gly	Thr	Leu	Ala	Ser	Gly	Thr	Gln	Ala	Ser	Gly
20				515				520					525			
	Tyr	Ala	His	Met	Gln	Asn	Ala	Thr	Gly	Leu	Pro	Thr	Asp	Gly	Phe	Thr
		530					535					540				
25	Tyr	Lys	Trp	Asn	Arg	Asp	Thr	Thr	Gly	Thr	Asn	Asp	Ala	Asn	Trp	Ser
						550					555					560
	Ala	Met	Asn	Lys	Pro	Asn	Val	Ala	Lys	Val	Val	Asn	Ala	Lys	Tyr	Asp
					565					570					575	
30	Val	Ile	Tyr	Asn	Gly	His	Thr	Phe	Ala	Thr	Ser	Leu	Pro	Ala	Lys	Phe
				580					585					590		
	Val	Val	Lys	Asp	Val	Gln	Pro	Ala	Lys	Pro	Thr	Val	Thr	Glu	Thr	Ala
35				595				600						605		
	Ala	Gly	Ala	Ile	Thr	Ile	Ala	Pro	Gly	Ala	Asn	Gln	Thr	Val	Asn	Thr
		610					615					620				
40	His	Ala	Gly	Asn	Val	Thr	Thr	Tyr	Ala	Asp	Lys	Leu	Val	Ile	Lys	Arg
		625				630					635					640
	Asn	Gly	Asn	Val	Val	Thr	Thr	Phe	Thr	Arg	Arg	Asn	Asn	Thr	Ser	Pro
					645					650					655	
45	Trp	Val	Lys	Glu	Ala	Ser	Ala	Ala	Thr	Val	Ala	Gly	Ile	Ala	Gly	Thr
				660					665					670		
	Asn	Asn	Gly	Ile	Thr	Val	Ala	Ala	Gly	Thr	Phe	Asn	Pro	Ala	Asp	Thr
50				675				680					685			
	Ile	Gln	Val	Val	Ala	Thr	Gln	Gly	Ser	Gly	Glu	Thr	Val	Ser	Asp	Glu
		690					695					700				
55	Gln	Arg	Ser	Asp	Asp	Phe	Thr	Val	Val	Ala	Pro	Gln	Pro	Asn	Gln	Ala
		705				710					715					720
	Thr	Thr	Lys	Ile	Trp	Gln	Asn	Gly	His	Ile	Asp	Ile	Thr	Pro	Asn	Asn
					725					730					735	
60	Pro	Ser	Gly	His	Leu	Ile	Asn	Pro	Thr	Gln	Ala	Met	Asp	Ile	Ala	Tyr
				740					745					750		

	Thr	Glu	Lys	Val	Gly	Asn	Gly	Ala	Glu	His	Ser	Lys	Thr	Ile	Asn	Val	
			755					760					765				
5	Val	Arg	Gly	Gln	Asn	Asn	Gln	Trp	Thr	Ile	Ala	Asn	Lys	Pro	Asp	Tyr	
		770					775					780					
	Val	Thr	Leu	Asp	Ala	Gln	Thr	Gly	Lys	Val	Thr	Phe	Asn	Ala	Asn	Thr	
	785					790					795					800	
10	Ile	Lys	Pro	Asn	Ser	Ser	Ile	Thr	Ile	Thr	Pro	Lys	Ala	Gly	Thr	Gly	
					805					810					815		
	His	Ser	Val	Ser	Ser	Asn	Pro	Ser	Thr	Leu	Thr	Ala	Pro	Ala	Ala	His	
				820					825					830			
15	Thr	Val	Asn	Thr	Thr	Glu	Ile	Val	Lys	Asp	Tyr	Gly	Ser	Asn	Val	Thr	
			835					840					845				
	Ala	Ala	Glu	Ile	Asn	Asn	Ala	Val	Gln	Val	Ala	Asn	Lys	Arg	Thr	Ala	
20		850					855					860					
	Thr	Ile	Lys	Asn	Gly	Thr	Ala	Met	Pro	Thr	Asn	Leu	Ala	Gly	Gly	Ser	
	865					870					875					880	
25	Thr	Thr	Thr	Ile	Pro	Val	Thr	Val	Thr	Tyr	Asn	Asp	Gly	Ser	Thr	Glu	
					885					890					895		
	Glu	Val	Gln	Glu	Ser	Ile	Phe	Thr	Lys	Ala	Asp	Lys	Arg	Glu	Leu	Ile	
				900					905					910			
30	Thr	Ala	Lys	Asn	His	Leu	Asp	Asp	Pro	Val	Ser	Thr	Glu	Gly	Lys	Lys	
			915					920					925				
	Pro	Gly	Thr	Ile	Thr	Gln	Tyr	Asn	Asn	Ala	Met	His	Asn	Ala	Gln	Gln	
35		930					935					940					
	Gln	Ile	Asn	Thr	Ala	Lys	Thr	Glu	Ala	Gln	Gln	Val	Ile	Asn	Asn	Glu	
	945					950					955					960	
40	Arg	Ala	Thr	Pro	Gln	Gln	Val	Ser	Asp	Ala	Leu	Thr	Lys	Val	Arg	Ala	
					965					970					975		
	Ala	Gln	Thr	Lys	Ile	Asp	Gln	Ala	Lys	Ala	Leu	Leu	Gln	Asn	Lys	Glu	
				980					985					990			
45	Asp	Asn	Ser	Gln	Leu	Val	Thr	Ser	Lys	Asn	Asn	Leu	Gln	Ser	Ser	Val	
			995					1000					1005				
	Asn	Gln	Val	Pro	Ser	Thr	Ala	Gly	Met	Thr	Gln	Gln	Ser	Ile	Asp	Asn	
50		1010					1015					1020					
	Tyr	Asn	Ala	Lys	Lys	Arg	Glu	Ala	Glu	Thr	Glu	Ile	Thr	Ala	Ala	Gln	
	1025					1030					1035					1040	
55	Arg	Val	Ile	Asp	Asn	Gly	Asp	Ala	Thr	Ala	Gln	Gln	Ile	Ser	Asp	Glu	
					1045					1050					1055		
	Lys	His	Arg	Val	Asp	Asn	Ala	Leu	Thr	Ala	Leu	Asn	Gln	Ala	Lys	His	
				1060					1065					1070			
60	Asp	Leu	Thr	Ala	Asp	Thr	His	Ala	Leu	Glu	Gln	Ala	Val	Gln	Gln	Leu	
			1075					1080					1085				

	Asn Arg Thr Gly Thr Thr Thr Gly Lys Lys Pro Ala Ser Ile Thr Ala	
	1090	1095 1100
5	Tyr Asn Asn Ser Ile Arg Ala Leu Gln Ser Asp Leu Thr Ser Ala Lys	
	1105	1110 1115 1120
	Asn Ser Ala Asn Ala Ile Ile Gln Lys Pro Ile Arg Thr Val Gln Glu	
		1125 1130 1135
10	Val Gln Ser Ala Leu Thr Asn Val Asn Arg Val Asn Glu Arg Leu Thr	
		1140 1145 1150
	Gln Ala Ile Asn Gln Leu Val Pro Leu Ala Asp Asn Ser Ala Leu Lys	
		1155 1160 1165
15	Thr Ala Lys Thr Lys Leu Asp Glu Glu Ile Asn Lys Ser Val Thr Thr	
		1170 1175 1180
	Asp Gly Met Thr Gln Ser Ser Ile Gln Ala Tyr Glu Asn Ala Lys Arg	
20		1185 1190 1195 1200
	Ala Gly Gln Thr Glu Ser Thr Asn Ala Gln Asn Val Ile Asn Asn Gly	
		1205 1210 1215
25	Asp Ala Thr Asp Gln Gln Ile Ala Ala Glu Lys Thr Lys Val Glu Glu	
		1220 1225 1230
	Lys Tyr Asn Ser Leu Lys Gln Ala Ile Ala Gly Leu Thr Pro Asp Leu	
		1235 1240 1245
30	Ala Pro Leu Gln Thr Ala Lys Thr Gln Leu Gln Asn Asp Ile Asp Gln	
		1250 1255 1260
	Pro Thr Ser Thr Thr Gly Met Thr Ser Ala Ser Ile Ala Ala Phe Asn	
35		1265 1270 1275 1280
	Glu Lys Leu Ser Ala Ala Arg Thr Lys Ile Gln Glu Ile Asp Arg Val	
		1285 1290 1295
40	Leu Ala Ser His Pro Asp Val Ala Thr Ile Arg Gln Asn Val Thr Ala	
		1300 1305 1310
	Ala Asn Ala Ala Lys Ser Ala Leu Asp Gln Ala Arg Asn Gly Leu Thr	
		1315 1320 1325
45	Val Asp Lys Ala Pro Leu Glu Asn Ala Lys Asn Gln Leu Gln Tyr Ser	
		1330 1335 1340
	Ile Asp Thr Gln Thr Ser Thr Thr Gly Met Thr Gln Asp Ser Ile Asn	
50		1345 1350 1355 1360
	Ala Tyr Asn Ala Lys Leu Thr Ala Ala Arg Asn Lys Ile Gln Gln Ile	
		1365 1370 1375
55	Asn Gln Val Leu Ala Gly Ser Pro Thr Val Glu Gln Ile Asn Thr Asn	
		1380 1385 1390
	Thr Ser Thr Ala Asn Gln Ala Lys Ser Asp Leu Asp His Ala Arg Gln	
		1395 1400 1405
60	Ala Leu Thr Pro Asp Lys Ala Pro Leu Gln Thr Ala Lys Thr Gln Leu	
		1410 1415 1420

Glu Gln Ser Ile Asn Gln Pro Thr Asp Thr Thr Gly Met Thr Thr Ala
 1425 1430 1435 1440
 5 Ser Leu Asn Ala Tyr Asn Gln Lys Leu Gln Ala Ala Arg Gln Lys Leu
 1445 1450 1455
 Thr Glu Ile Asn Gln Val Leu Asn Gly Asn Pro Thr Val Gln Asn Ile
 1460 1465 1470
 10 Asn Asp Lys Val Thr Glu Ala Asn Gln Ala Lys Asp Gln Leu Asn Thr
 1475 1480 1485
 Ala Arg Gln Gly Leu Thr Leu Asp Arg Gln Pro Ala Leu Thr Thr Leu
 1490 1495 1500
 15 His Gly Ala Ser Asn Leu Asn Gln Ala Gln Gln Asn Asn Phe Thr Gln
 1505 1510 1515 1520
 Gln Ile Asn Ala Ala Gln Asn His Ala Ala Leu Glu Thr Ile Lys Ser
 1525 1530 1535
 Asn Ile Thr Ala Leu Asn Thr Ala Met Thr Lys Leu Lys Asp Ser Val
 1540 1545 1550
 25 Ala Asp Asn Asn Thr Ile Lys Ser Asp Gln Asn Tyr Thr Asp Ala Thr
 1555 1560 1565
 Pro Ala Asn Lys Gln Ala Tyr Asp Asn Ala Val Asn Ala Ala Lys Gly
 1570 1575 1580
 30 Val Ile Gly Glu Thr Thr Asn Pro Thr Met Asp Val Asn Thr Val Asn
 1585 1590 1595 1600
 Gln Lys Ala Ala Ser Val Lys Ser Thr Lys Asp Ala Leu Asp Gly Gln
 1605 1610 1615
 Gln Asn Leu Gln Arg Ala Lys Thr Glu Ala Thr Asn Ala Ile Thr His
 1620 1625 1630
 40 Ala Ser Asp Leu Asn Gln Ala Gln Lys Asn Ala Leu Thr Gln Gln Val
 1635 1640 1645
 Asn Ser Ala Gln Asn Val Gln Ala Val Asn Asp Ile Lys Gln Thr Thr
 1650 1655 1660
 45 Gln Ser Leu Asn Thr Ala Met Thr Gly Leu Lys Arg Gly Val Ala Asn
 1665 1670 1675 1680
 His Asn Gln Val Val Gln Ser Asp Asn Tyr Val Asn Ala Asp Thr Asn
 1685 1690 1695
 Lys Lys Asn Asp Tyr Asn Asn Ala Tyr Asn His Ala Asn Asp Ile Ile
 1700 1705 1710
 55 Asn Gly Asn Ala Gln His Pro Val Ile Thr Pro Ser Asp Val Asn Asn
 1715 1720 1725
 Ala Leu Ser Asn Val Thr Ser Lys Glu His Ala Leu Asn Gly Glu Ala
 1730 1735 1740
 60 Lys Leu Asn Ala Ala Lys Gln Glu Ala Asn Thr Ala Leu Gly His Leu
 1745 1750 1755 1760

Asn Asn Leu Asn Asn Ala Gln Arg Gln Asn Leu Gln Ser Gln Ile Asn
 1765 1770 1775
 5 Gly Ala His Gln Ile Asp Ala Val Asn Thr Ile Lys Gln Asn Ala Thr
 1780 1785 1790
 Asn Leu Asn Ser Ala Met Gly Asn Leu Arg Gln Ala Val Ala Asp Lys
 1795 1800 1805
 10 Asp Gln Val Lys Arg Thr Glu Asp Tyr Ala Asp Ala Asp Thr Ala Lys
 1810 1815 1820
 Gln Asn Ala Tyr Asn Ser Ala Val Ser Ser Ala Glu Thr Ile Ile Asn
 1825 1830 1835 1840
 15 Gln Thr Thr Asn Pro Thr Met Ser Val Asp Asp Val Asn Arg Ala Thr
 1845 1850 1855
 Ser Ala Val Thr Ser Asn Lys Asn Ala Leu Asn Gly Tyr Glu Lys Leu
 1860 1865 1870
 Ala Gln Ser Lys Thr Asp Ala Ala Arg Ala Ile Asp Ala Leu Pro His
 1875 1880 1885
 25 Leu Asn Asn Ala Gln Lys Ala Asp Val Lys Ser Lys Ile Asn Ala Ala
 1890 1895 1900
 Ser Asn Ile Ala Gly Val Asn Thr Val Lys Gln Gln Gly Thr Asp Leu
 1905 1910 1915 1920
 30 Asn Thr Ala Met Gly Asn Leu Gln Gly Ala Ile Asn Asp Glu Gln Thr
 1925 1930 1935
 Thr Leu Asn Ser Gln Asn Tyr Gln Asp Ala Thr Pro Ser Lys Lys Thr
 1940 1945 1950
 Ala Tyr Thr Asn Ala Val Gln Ala Ala Lys Asp Ile Leu Asn Lys Ser
 1955 1960 1965
 40 Asn Gly Gln Asn Lys Thr Lys Asp Gln Val Thr Glu Ala Met Asn Gln
 1970 1975 1980
 Val Asn Ser Ala Lys Asn Asn Leu Asp Gly Thr Arg Leu Leu Asp Gln
 1985 1990 1995 2000
 45 Ala Lys Gln Thr Ala Lys Gln Gln Leu Asn Asn Met Thr His Leu Thr
 2005 2010 2015
 Thr Ala Gln Lys Thr Asn Leu Thr Asn Gln Ile Asn Ser Gly Thr Thr
 2020 2025 2030
 Val Ala Gly Val Gln Thr Val Gln Ser Asn Ala Asn Thr Leu Asp Gln
 2035 2040 2045
 55 Ala Met Asn Thr Leu Arg Gln Ser Ile Ala Asn Lys Asp Ala Thr Lys
 2050 2055 2060
 Ala Ser Glu Asp Tyr Val Asp Ala Asn Asn Asp Lys Gln Thr Ala Tyr
 2065 2070 2075 2080
 60 Asn Asn Ala Val Ala Ala Ala Glu Thr Ile Ile Asn Ala Asn Ser Asn
 2085 2090 2095

Pro Glu Met Asn Pro Ser Thr Ile Thr Gln Lys Ala Glu Gln Val Asn
 2100 2105 2110
 5 Ser Ser Lys Thr Ala Leu Asn Gly Asp Glu Asn Leu Ala Ala Ala Lys
 2115 2120 2125
 Gln Asn Ala Lys Thr Tyr Leu Asn Thr Leu Thr Ser Ile Thr Asp Ala
 2130 2135 2140
 10 Gln Lys Asn Asn Leu Ile Ser Gln Ile Thr Ser Ala Thr Arg Val Ser
 2145 2150 2155 2160
 Gly Val Asp Thr Val Lys Gln Asn Ala Gln His Leu Asp Gln Ala Met
 2165 2170 2175
 15 Ala Ser Leu Gln Asn Gly Ile Asn Asn Glu Ser Gln Val Lys Ser Ser
 2180 2185 2190
 20 Glu Lys Tyr Arg Asp Ala Asp Thr Asn Lys Gln Gln Glu Tyr Asp Asn
 2195 2200 2205
 Ala Ile Thr Ala Ala Lys Ala Ile Leu Asn Lys Ser Thr Gly Pro Asn
 2210 2215 2220
 25 Thr Ala Gln Asn Ala Val Glu Ala Ala Leu Gln Arg Val Asn Asn Ala
 2225 2230 2235 2240
 Lys Asp Ala Leu Asn Gly Asp Ala Lys Leu Ile Ala Ala Gln Asn Ala
 2245 2250 2255
 30 Ala Lys Gln His Leu Gly Thr Leu Thr His Ile Thr Thr Ala Gln Arg
 2260 2265 2270
 35 Asn Asp Leu Thr Asn Gln Ile Ser Gln Ala Thr Asn Leu Ala Gly Val
 2275 2280 2285
 Glu Ser Val Lys Gln Asn Ala Asn Ser Leu Asp Gly Ala Met Gly Asn
 2290 2295 2300
 40 Leu Gln Thr Ala Ile Asn Asp Lys Ser Gly Thr Leu Ala Ser Gln Asn
 2305 2310 2315 2320
 Phe Leu Asp Ala Asp Glu Gln Lys Arg Asn Ala Tyr Asn Gln Ala Val
 2325 2330 2335
 45 Ser Ala Ala Glu Thr Ile Leu Asn Lys Gln Thr Gly Pro Asn Thr Ala
 2340 2345 2350
 50 Lys Thr Ala Val Glu Gln Ala Leu Asn Asn Val Asn Asn Ala Lys His
 2355 2360 2365
 Ala Leu Asn Gly Thr Gln Asn Leu Asn Asn Ala Lys Gln Ala Ala Ile
 2370 2375 2380
 55 Thr Ala Ile Asn Gly Ala Ser Asp Leu Asn Gln Lys Gln Lys Asp Ala
 2385 2390 2395 2400
 Leu Lys Ala Gln Ala Asn Gly Ala Gln Arg Val Ser Asn Ala Gln Asp
 2405 2410 2415
 60 Val Gln His Asn Ala Thr Glu Leu Asn Thr Ala Met Gly Thr Leu Lys
 2420 2425 2430

His Ala Ile Ala Asp Lys Thr Asn Thr Leu Ala Ser Ser Lys Tyr Val
 2435 2440 2445
 5 Asn Ala Asp Ser Thr Lys Gln Asn Ala Tyr Thr Thr Lys Val Thr Asn
 2450 2455 2460
 Ala Glu His Ile Ile Ser Gly Thr Pro Thr Val Val Thr Thr Pro Ser
 2465 2470 2475 2480
 10 Glu Val Thr Ala Ala Ala Asn Gln Val Asn Ser Ala Lys Gln Glu Leu
 2485 2490 2495
 Asn Gly Asp Glu Arg Leu Arg Glu Ala Lys Gln Asn Ala Asn Thr Ala
 2500 2505 2510
 15 Ile Asp Ala Leu Thr Gln Leu Asn Thr Pro Gln Lys Ala Lys Leu Lys
 2515 2520 2525
 Glu Gln Val Gly Gln Ala Asn Arg Leu Glu Asp Val Gln Thr Val Gln
 2530 2535 2540
 Thr Asn Gly Gln Ala Leu Asn Asn Ala Met Lys Gly Leu Arg Asp Ser
 2545 2550 2555 2560
 25 Ile Ala Asn Glu Thr Thr Val Lys Thr Ser Gln Asn Tyr Thr Asp Ala
 2565 2570 2575
 Ser Pro Asn Asn Gln Ser Thr Tyr Asn Ser Ala Val Ser Asn Ala Lys
 2580 2585 2590
 30 Gly Ile Ile Asn Gln Thr Asn Asn Pro Thr Met Asp Thr Ser Ala Ile
 2595 2600 2605
 Thr Gln Ala Thr Thr Gln Val Asn Asn Ala Lys Asn Gly Leu Asn Gly
 2610 2615 2620
 Ala Glu Asn Leu Arg Asn Ala Gln Asn Thr Ala Lys Gln Asn Leu Asn
 2625 2630 2635 2640
 40 Thr Leu Ser His Leu Thr Asn Asn Gln Lys Ser Ala Ile Ser Ser Gln
 2645 2650 2655
 Ile Asp Arg
 45
 <210> 29
 <211> 496
 <212> PRT
 50 <213> Staphylococcus aureus
 <400> 29
 Met Asn Met Lys Lys Lys Glu Lys His Ala Ile Arg Lys Lys Ser Ile
 1 5 10 15
 55 Gly Val Ala Ser Val Leu Val Gly Thr Leu Ile Gly Phe Gly Leu Leu
 20 25 30
 Ser Ser Lys Glu Ala Asp Ala Ser Glu Asn Ser Val Thr Gln Ser Asp
 35 40 45
 60 Ser Ala Ser Asn Glu Ser Lys Ser Asn Asp Ser Ser Ser Val Ser Ala
 50 55 60

	Ala	Pro	Lys	Thr	Asp	Asp	Thr	Asn	Val	Ser	Asp	Thr	Lys	Thr	Ser	Ser	
	65					70					75					80	
5	Asn	Thr	Asn	Asn	Gly	Glu	Thr	Ser	Val	Ala	Gln	Asn	Pro	Ala	Gln	Gln	
					85					90					95		
	Glu	Thr	Thr	Gln	Ser	Ser	Ser	Thr	Asn	Ala	Thr	Thr	Glu	Glu	Thr	Pro	
				100					105					110			
10	Val	Thr	Gly	Glu	Ala	Thr	Thr	Thr	Thr	Thr	Asn	Gln	Ala	Asn	Thr	Pro	
			115					120					125				
	Ala	Thr	Thr	Gln	Ser	Ser	Asn	Thr	Asn	Ala	Glu	Glu	Leu	Val	Asn	Gln	
15		130					135					140					
	Thr	Ser	Asn	Glu	Thr	Thr	Phe	Asn	Asp	Thr	Asn	Thr	Val	Ser	Ser	Val	
	145					150					155					160	
20	Asn	Ser	Pro	Gln	Asn	Ser	Thr	Asn	Ala	Glu	Asn	Val	Ser	Thr	Thr	Gln	
				165						170					175		
	Asp	Thr	Ser	Thr	Glu	Ala	Thr	Pro	Ser	Asn	Asn	Glu	Ser	Ala	Pro	Gln	
				180					185					190			
25	Ser	Thr	Asp	Ala	Ser	Asn	Lys	Asp	Val	Val	Asn	Gln	Ala	Val	Asn	Thr	
			195					200					205				
	Ser	Ala	Pro	Arg	Met	Arg	Ala	Phe	Ser	Leu	Ala	Ala	Val	Ala	Ala	Asp	
30		210					215					220					
	Ala	Pro	Ala	Ala	Gly	Thr	Asp	Ile	Thr	Asn	Gln	Leu	Thr	Asn	Val	Thr	
	225					230					235					240	
35	Val	Gly	Ile	Asp	Ser	Gly	Thr	Thr	Val	Tyr	Pro	His	Gln	Ala	Gly	Tyr	
					245					250					255		
	Val	Lys	Leu	Asn	Tyr	Gly	Phe	Ser	Val	Pro	Asn	Ser	Ala	Val	Lys	Gly	
				260					265					270			
40	Asp	Thr	Phe	Lys	Ile	Thr	Val	Pro	Lys	Glu	Leu	Asn	Leu	Asn	Gly	Val	
			275					280					285				
	Thr	Ser	Thr	Ala	Lys	Val	Pro	Pro	Ile	Met	Ala	Gly	Asp	Gln	Val	Leu	
45		290					295					300					
	Ala	Asn	Gly	Val	Ile	Asp	Ser	Asp	Gly	Asn	Val	Ile	Tyr	Thr	Phe	Thr	
	305					310					315					320	
50	Asp	Tyr	Val	Asn	Thr	Lys	Asp	Asp	Val	Lys	Ala	Thr	Leu	Thr	Met	Pro	
				325						330					335		
	Ala	Tyr	Ile	Asp	Pro	Glu	Asn	Val	Lys	Lys	Thr	Gly	Asn	Val	Thr	Leu	
				340					345					350			
55	Ala	Thr	Gly	Ile	Gly	Ser	Thr	Thr	Ala	Asn	Lys	Thr	Val	Leu	Val	Asp	
			355					360					365				
	Tyr	Glu	Lys	Tyr	Gly	Lys	Phe	Tyr	Asn	Leu	Ser	Ile	Lys	Gly	Thr	Ile	
60		370					375					380					
	Asp	Gln	Ile	Asp	Lys	Thr	Asn	Asn	Thr	Tyr	Arg	Gln	Thr	Ile	Tyr	Val	
	385					390					395					400	

Asn Pro Ser Gly Asp Asn Val Ile Ala Pro Val Leu Thr Gly Asn Leu
 405 410 415
 5 Lys Pro Asn Thr Asp Ser Asn Ala Leu Ile Asp Gln Gln Asn Thr Ser
 420 425 430
 Ile Lys Val Tyr Lys Val Asp Asn Ala Ala Asp Leu Ser Glu Ser Tyr
 435 440 445
 10 Phe Val Asn Pro Glu Asn Phe Glu Asp Val Thr Asn Ser Val Asn Ile
 450 455 460
 15 Thr Phe Pro Asn Pro Asn Gln Tyr Lys Val Glu Phe Asn Thr Pro Asp
 465 470 475 480
 Asp Gln Ile Thr Thr Pro Tyr Ile Val Val Val Asn Gly His Ile Asp
 485 490 495
 20
 25 <210> 30
 <211> 541
 <212> PRT
 <213> Staphylococcus aureus
 30 <400> 30
 Asp Gln Tyr Leu Leu Glu Arg Lys Lys Ser Gln Tyr Glu Asp Tyr Lys
 1 5 10 15
 Gln Trp Tyr Ala Asn Tyr Lys Lys Glu Asn Pro Arg Thr Asp Leu Lys
 20 25 30
 35 Met Ala Asn Phe His Lys Tyr Asn Leu Glu Glu Leu Ser Met Lys Glu
 35 40 45
 40 Tyr Asn Glu Leu Gln Asp Ala Leu Lys Arg Ala Leu Asp Asp Phe His
 50 55 60
 Arg Glu Val Lys Asp Ile Lys Asp Lys Asn Ser Asp Leu Lys Thr Phe
 65 70 75 80
 45 Asn Ala Ala Glu Glu Asp Lys Ala Thr Lys Glu Val Tyr Asp Leu Val
 85 90 95
 Ser Glu Ile Asp Thr Leu Val Val Ser Tyr Tyr Gly Asp Lys Asp Tyr
 100 105 110
 50 Gly Glu His Ala Lys Glu Leu Arg Ala Lys Leu Asp Leu Ile Leu Gly
 115 120 125
 55 Asp Thr Asp Asn Pro His Lys Ile Thr Asn Glu Arg Ile Lys Lys Glu
 130 135 140
 Met Ile Asp Asp Leu Asn Ser Ile Ile Asp Asp Phe Phe Met Glu Thr
 145 150 155 160
 60 Lys Gln Asn Arg Pro Lys Ser Ile Thr Lys Tyr Asn Pro Thr Thr His
 165 170 175
 Asn Tyr Lys Thr Asn Ser Asp Asn Lys Pro Asn Phe Asp Lys Leu Val

	180							185							190						
5	Glu	Glu	Thr	Lys	Lys	Ala	Val	Lys	Glu	Ala	Asp	Asp	Ser	Trp	Lys	Lys					
			195					200					205								
	Lys	Thr	Val	Lys	Lys	Tyr	Gly	Glu	Thr	Glu	Thr	Lys	Ser	Pro	Val	Val					
		210					215					220									
10	Lys	Glu	Glu	Lys	Lys	Val	Glu	Glu	Pro	Gln	Ala	Pro	Lys	Val	Asp	Asn					
	225					230					235					240					
	Gln	Gln	Glu	Val	Lys	Thr	Thr	Ala	Gly	Lys	Ala	Glu	Glu	Thr	Thr	Gln					
					245					250					255						
15	Pro	Val	Ala	Gln	Pro	Leu	Val	Lys	Ile	Pro	Gln	Gly	Thr	Ile	Thr	Gly					
				260					265					270							
	Glu	Ile	Val	Lys	Gly	Pro	Glu	Tyr	Pro	Thr	Met	Glu	Asn	Lys	Thr	Val					
			275					280					285								
20	Gln	Gly	Glu	Ile	Val	Gln	Gly	Pro	Asp	Phe	Leu	Thr	Met	Glu	Gln	Ser					
		290					295					300									
25	Gly	Pro	Ser	Leu	Ser	Asn	Asn	Tyr	Thr	Asn	Pro	Pro	Leu	Thr	Asn	Pro					
	305					310					315					320					
	Ile	Leu	Glu	Gly	Leu	Glu	Gly	Ser	Ser	Ser	Lys	Leu	Glu	Ile	Lys	Pro					
					325					330					335						
30	Gln	Gly	Thr	Glu	Ser	Thr	Leu	Lys	Gly	Thr	Gln	Gly	Glu	Ser	Ser	Asp					
				340					345					350							
	Ile	Glu	Val	Lys	Pro	Gln	Ala	Thr	Glu	Thr	Thr	Glu	Ala	Ser	Gln	Tyr					
			355					360					365								
35	Gly	Pro	Arg	Pro	Gln	Phe	Asn	Lys	Thr	Pro	Lys	Tyr	Val	Lys	Tyr	Arg					
		370					375					380									
40	Asp	Ala	Gly	Thr	Gly	Ile	Arg	Glu	Tyr	Asn	Asp	Gly	Thr	Phe	Gly	Tyr					
	385					390					395					400					
	Glu	Ala	Arg	Pro	Arg	Phe	Asn	Lys	Pro	Ser	Glu	Thr	Asn	Ala	Tyr	Asn					
					405					410					415						
45	Val	Thr	Thr	His	Ala	Asn	Gly	Gln	Val	Ser	Tyr	Gly	Ala	Arg	Pro	Thr					
				420					425					430							
	Tyr	Lys	Lys	Pro	Ser	Glu	Thr	Asn	Ala	Tyr	Asn	Val	Thr	Thr	His	Ala					
			435					440					445								
50	Asn	Gly	Gln	Val	Ser	Tyr	Gly	Ala	Arg	Pro	Thr	Gln	Asn	Lys	Pro	Ser					
		450					455					460									
55	Lys	Thr	Asn	Ala	Tyr	Asn	Val	Thr	Thr	His	Gly	Asn	Gly	Gln	Val	Ser					
	465					470					475					480					
	Tyr	Gly	Ala	Arg	Gln	Ala	Gln	Asn	Lys	Pro	Ser	Lys	Thr	Asn	Ala	Tyr					
					485					490					495						
60	Asn	Val	Thr	Thr	His	Ala	Asn	Gly	Gln	Val	Ser	Tyr	Gly	Ala	Arg	Pro					
				500					505					510							
	Thr	Tyr	Lys	Lys	Pro	Ser	Lys	Thr	Asn	Ala	Tyr	Asn	Val	Thr	Thr	His					

	515	520	525
5	Ala Asp Gly Thr Ala Thr Tyr	Gly Pro Arg Val Thr Lys	
	530	535	540
10	<210> 31 <211> 356 <212> PRT <213> Staphylococcus aureus		
15	<400> 31 Met Lys Met Arg Thr Ile Ala Lys Thr Ser Leu Ala Leu Gly Leu Leu 1 5 10 15		
20	Thr Thr Gly Ala Ile Thr Val Thr Thr Gln Ser Val Lys Ala Glu Lys 20 25 30		
25	Ile Gln Ser Thr Lys Val Asp Lys Val Pro Thr Leu Lys Ala Glu Arg 35 40 45		
30	Leu Ala Met Ile Asn Ile Thr Ala Gly Ala Asn Ser Ala Thr Thr Gln 50 55 60		
35	Ala Ala Asn Thr Arg Gln Glu Arg Thr Pro Lys Leu Glu Lys Ala Pro 65 70 75 80		
40	Asn Thr Asn Glu Glu Lys Thr Ser Ala Ser Lys Ile Glu Lys Ile Ser 85 90 95		
45	Gln Pro Lys Gln Glu Glu Gln Lys Thr Leu Asn Ile Ser Ala Thr Pro 100 105 110		
50	Ala Pro Lys Gln Glu Gln Ser Gln Thr Thr Thr Glu Ser Thr Thr Pro 115 120 125		
55	Lys Thr Lys Val Thr Thr Pro Pro Ser Thr Asn Thr Pro Gln Pro Met 130 135 140		
60	Gln Ser Thr Lys Ser Asp Thr Pro Gln Ser Pro Thr Ile Lys Gln Ala 145 150 155 160		
	Gln Thr Asp Met Thr Pro Lys Tyr Glu Asp Leu Arg Ala Tyr Tyr Thr 165 170 175		
	Lys Pro Ser Phe Glu Phe Glu Lys Gln Phe Gly Phe Met Leu Lys Pro 180 185 190		
	Trp Thr Thr Val Arg Phe Met Asn Val Ile Pro Asn Arg Phe Ile Tyr 195 200 205		
	Lys Ile Ala Leu Val Gly Lys Asp Glu Lys Lys Tyr Lys Asp Gly Pro 210 215 220		
	Tyr Asp Asn Ile Asp Val Phe Ile Val Leu Glu Asp Asn Lys Tyr Gln 225 230 235 240		
	Leu Lys Lys Tyr Ser Val Gly Gly Ile Thr Lys Thr Asn Ser Lys Lys 245 250 255		
	Val Asn His Lys Val Glu Leu Ser Ile Thr Lys Lys Asp Asn Gln Gly 260 265 270		

Met Ile Ser Arg Asp Val Ser Glu Tyr Met Ile Thr Lys Glu Glu Ile
 275 280 285
 5 Ser Leu Lys Glu Leu Asp Phe Lys Leu Arg Lys Gln Leu Ile Glu Lys
 290 295 300
 His Asn Leu Tyr Gly Asn Met Gly Ser Gly Thr Ile Val Ile Lys Met
 305 310 315 320
 10 Lys Asn Gly Gly Lys Tyr Thr Phe Glu Leu His Lys Lys Leu Gln Glu
 325 330 335
 His Arg Met Ala Asp Val Ile Asp Gly Thr Asn Ile Asp Asn Ile Glu
 340 345 350
 15 Val Asn Ile Lys
 355
 20 <210> 32
 <211> 313
 <212> PRT
 <213> Staphylococcus aureus
 25 <400> 32
 Met Glu His Thr Thr Met Lys Ile Thr Thr Ile Ala Lys Thr Ser Leu
 1 5 10 15
 30 Ala Leu Gly Leu Leu Thr Thr Gly Val Ile Thr Thr Thr Thr Gln Ala
 20 25 30
 Ala Asn Ala Thr Thr Leu Ser Ser Thr Lys Val Glu Ala Pro Gln Ser
 35 40 45
 35 Thr Pro Pro Ser Thr Lys Ile Glu Ala Pro Gln Ser Lys Pro Asn Ala
 50 55 60
 Thr Thr Pro Pro Ser Thr Lys Val Glu Ala Pro Gln Gln Thr Ala Asn
 65 70 75 80
 40 Ala Thr Thr Pro Pro Ser Thr Lys Val Thr Thr Pro Pro Ser Thr Asn
 85 90 95
 45 Thr Pro Gln Pro Met Gln Ser Thr Lys Ser Asp Thr Pro Gln Ser Pro
 100 105 110
 Thr Thr Lys Gln Val Pro Thr Glu Ile Asn Pro Lys Phe Lys Asp Leu
 115 120 125
 50 Arg Ala Tyr Tyr Thr Lys Pro Ser Leu Glu Phe Lys Asn Glu Ile Gly
 130 135 140
 Ile Ile Leu Lys Lys Trp Thr Thr Ile Arg Phe Met Asn Val Val Pro
 145 150 155 160
 55 Asp Tyr Phe Ile Tyr Lys Ile Ala Leu Val Gly Lys Asp Asp Lys Lys
 165 170 175
 60 Tyr Gly Glu Gly Val His Arg Asn Val Asp Val Phe Val Val Leu Glu
 180 185 190
 Glu Asn Asn Tyr Asn Leu Glu Lys Tyr Ser Val Gly Gly Ile Thr Lys
 195 200 205

Ser Asn Ser Lys Lys Val Asp His Lys Ala Gly Val Arg Ile Thr Lys
210 215 220

5 Glu Asp Asn Lys Gly Thr Ile Ser His Asp Val Ser Glu Phe Lys Ile
225 230 235 240

Thr Lys Glu Gln Ile Ser Leu Lys Glu Leu Asp Phe Lys Leu Arg Lys
245 250 255

10 Gln Leu Ile Glu Lys Asn Asn Leu Tyr Gly Asn Val Gly Ser Gly Lys
260 265 270

15 Ile Val Ile Lys Met Lys Asn Gly Gly Lys Tyr Thr Phe Glu Leu His
275 280 285

Lys Lys Leu Gln Glu Asn Arg Met Ala Asp Val Ile Asp Gly Thr Asn
290 295 300

20 Ile Asp Asn Ile Glu Val Asn Ile Lys
305 310

25

30

35

40

45

50

55

60

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 01/02685

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/31 C12N15/63 G01N33/68 C07K14/31 A61K39/085
 C07K16/12 C12N5/12 A61K39/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N G01N C07K A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, EMBL, WPI Data, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ARIFUR RAHMAN ET AL.: "Gamma-Hemolysin genes in the same family with LukF and lukS genes in methicillin resistant Staphylococcus aureus" BIOSCIENCE BIOTECHNOLOGY BIOCHEMISTRY., vol. 57, no. 7, 1993, pages 1234-1236, XP002177747 TOKYO JP the whole document	1-9, 18-48
A	--- WO 99 50418 A (NEUTEC PHARMA PLC) 7 October 1999 (1999-10-07) the whole document -----	1-9, 18-49

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 September 2001

Date of mailing of the international search report

19. 11. 2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

MONTERO LOPEZ B.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 01/02685

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Although claims 26-32 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Partially 1-9, 18-49

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 01/02685

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: Partially 1-9, 18-49

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:1, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

2. Claims: Partially 1-9, 18-49

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:2, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

3. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:3, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

4. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:4, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 01/02685

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

5. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:5, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

6. Claims: Partially 1-9, 18-48

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:6, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

7. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:7, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

8. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:8, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

9. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 01/02685

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

SEQ ID NO:9, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

10. Claims: Partially 1-9, 18-48

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:10, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

11. Claims: Partially 1-9, 18-48

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:11, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

12. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:12, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

13. Claims: Partially 1-9, 19-46

Staphylococcus aureus antigen encoded by a DNA sequence of SEQ ID NO:13, DNA sequence and variants thereof; vectors and host cells comprising the same and their use for the production of the polypeptide; vaccine comprising the

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 01/02685

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

antigen and its use in immunisation; antibodies directed to the antigen and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament; use of the polypeptides for preparing a hybridoma cell-line.

14. Claims: 10-17, and partially 24-46

Method to identify antigenic polypeptides by transfecting a pathogenic organism gene library into a host cell and contacting the expressed polypeptides with autologous antisera from an animal infected with the pathogenic organism; polypeptides so obtained, vaccines comprising the antigenic polypeptides and use in immunisation; antibodies directed to the antigenic polypeptides and vectors and hybridoma cells for their production; use of the antibodies for the manufacture of a medicament.

Information on patent family members

PCT/GB 01/02685

Form PCT/ISA/210 (patent family annex) (July 1992)